VIRGIN ISLANDS
WATER AND POWER
AUTHORITY

OFFICE OF THE
CHIEF EXECUTIVE OFFICER

Vlenergize
Energy Revolution... We Are the Solution

P.O. BOX 1450,
St. Thomas, Virgin Islands
00804-1450
TELEPHONE: (340) 774-3552

March 1, 2017

Mr. Myles E. Flint, II
Senior Counsel
Environmental Enforcement Section
Environment & Natural Resources Division
U.S. Department of Justice
Box 7611 Ben Franklin Station
Washington, DC 20044-7611

Re: Second and Final Request for Reimbursement of Training Service Costs per the Supplemental Environmental Project (SEP) under the HOVENSA Consent Decree

Dear Mr. Flint:

This is our second and final request for reimbursement of costs for CEMS/COMS training of Virgin Islands Water and Power Authority (WAPA) personnel on both islands as provided for under the HOVENSA Consent Decree SEP. The first invoice was submitted on February 17, 2016 after several iterations with HOVENSA's Special Consultant. This invoice was developed to be consistent with the first invoice, which is included with this submittal as Appendix C.

Rockwell Automation and its subcontractor QA Analytics (QA) provided WAPA with assistance on the operation and the maintenance of the continuous emissions monitoring systems and the continuous opacity monitoring systems at our two generating stations in the Virgin Islands. Rockwell/QA has trained our staff in special classroom training sessions and in routine on-site training through its field technician who was on site for the three-year period of the contract that concluded in June 2016. WAPA has benefited greatly from the training provided relative to monitoring emissions and opacity at both of its facilities. As a follow-on to that outside training support, WAPA has entered into a contract with Teledyne to provide similar support.

A summary of all costs that we believe are reimbursable under the SEP is enclosed. WAPA is herein requesting reimbursement of a total of **$181,736.**

Some additional explanation of the costs identified in the attached summary invoice is in order. The Rockwell invoices presented to WAPA show the exact same amount ($4,881)

for each month related to training (see the invoices in Attachment A). The contract with Rockwell was fixed price and the cost for the special extended training services was spread evenly over the 36-month life of the contract. The line item cost for the special training is $175,713 over the 36-month period or about $4,881 per month. The first invoice reflected a charge of $112,263 for the first 23 months. This reimbursement request is for the remaining 13 months at $4,881 per month for a total of $63,450. We have accepted and paid for those services according to the terms of the fixed-price contract we had with Rockwell. Rockwell has provided supporting time sheet information for its on-site personnel as well as those conducting the training. Please advise us if you want to review that supporting time sheet data and we will send it to you on a thumb drive.

The second item on the invoice is for travel expenses not covered by the Contract (No. SC-47-13). Additional time and travel expenses were incurred for the training course provided by Rockwell/QA in March 2016. Subsequently, WAPA approved and issued a purchase order for $53,153 to cover those expenses. The PO and Rockwell invoice are included in Appendix B.

The third item is the portion of the on-site technician's travel costs for the final ten months of the contract related to training WAPA personnel. Based on the technician's daily time logs, Rockwell calculated the fraction of the technician's total time that was related to *training* WAPA personnel on CEMS operation. That fraction, 23%, was used with the total travel expenses for the technician to determine travel costs related to training alone. The balance of the technician's time while on-site was associated with operating the CEMS (QA checks, calibrations, cylinder gas management, etc.).

The fourth item on the invoice is related to the updates needed for the QAP and identified in the Contract as Procedures. This is a line item from the Contract for Year 3, the final year of the contracted effort, in the amount of $28,571. Those costs for the first two years of the Contract were included in the first invoice (February 17, 2016).

The fifth and final item listed is for maintenance of the spare parts inventory system. That item was also based on pro-rata billing under the Rockwell Contract in the amount of $5,024 per month. This invoice covers the five months not billed under the first invoice.

As mentioned earlier, we are also attaching our first invoice as Appendix C for comparison purposes since significant justification was provided in that invoice at the request of Mr. Fermin, HOVENSAs Special Consultant who was assigned the task of reviewing material provided. Mr. Fermin requested a significant amount of supplemental information on the training course, breakdown on the technician's activities, classroom attendees, etc.

Please advise us if additional information is needed to support the Rockwell invoices provided to WAPA. Those invoices have been paid by WAPA.

The reimbursement check should be sent to:

Julio Rhymer
Chief Executive Officer
Virgin Islands Water and Power Authority
P.O. Box 1450
St Thomas, USVI 00804-1450

Phone: (340) 774-3552
E-mail:rhymerja@viwapa.vi

We greatly appreciate your assistance with this matter. Please feel free to call me if you have any questions.

Yours truly,

Julio Rhymer
Chief Executive Officer
Virgin Islands Water and Power Authority

Enclosures

cc: Environmental Resource Trust
Greg Rhymer, WAPA
Kevin Smalls, WAPA

SUMMARY OF TRAINING COSTS
FOR CONTINUOUS EMISSIONS MONITORING SYSTEMS

SECOND INVOICE

Classroom and on-site training Invoiced inception through July 2015 was $112,263 This is remainder (August 2015 thru June 2016) of training not previously invoiced from the Contract value of $175,713	$63,450
Documented Change request for time and travel expenses associated with the March 2016 training course (see WAPA PO and Rockwell invoice in Appendix B)	53,153
Travel expenses for on-site training activities prorated from total travel costs for on-site technician (see initial estimate provided by Rockwell in Appendix D, Tab #2, of original invoice), which is $4,975 x 10 months x 23%	11,442
Rockwell/QA professional time to develop the Procedures (QAP) for operating the CEMS/COMS. Line item Contract value for Year #3, $28,571, not previously billed.	28,571
Rockwell/QA professional time for development and maintenance of spare parts inventory for CEMS/COMS based on actual billings from Rockwell for February thru June 2016 at $5,024/month	25,120
TOTAL	**$181,736**

APPENDIX A

ROCKWELL INVOICES JULY 2015 TO AUGUST 2016

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		06/21/16	144296
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract		1 OF 1

Ship to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Invoice to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Remit to
Rockwell Automation Puerto Rico Inc.
Calle 1 Metro Office 6 Suite 304, Guaynabo PR.

Sold to

Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Special Marks

Correspondence to

Payment Terms: 30 days

Shipped From

VIA

Delivery Terms Destino **Freight**

Shipped Date	Gross Weight	Net Weights	Status
06/21/2016	0.00	0.00	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	PROGRESS BILLING			PROGRESS BILLING (SSB) YEAR TWO INVOICING ESTMT TRAVEL & LIVING EXPENSES MONTH 11 $4,975.00 PO: Contract No. SC-47-13 YEAR TWO INVOICING ESTMT TRAVEL & LIVING EXPENSES MONTH 12 $4,975.00 PO: Contract No. SC-47-13	1.0	4,975.00000	4,975.00
2	PROGRESS BILLING			PROGRESS BILLING (SSB) YEAR TWO INVOICING ESTMT TRAVEL & LIVING EXPENSES MONTH 11 $4,975.00 PO: Contract No. SC-47-13 YEAR TWO INVOICING ESTMT TRAVEL & LIVING EXPENSES MONTH 12 $4,975.00 PO: Contract No. SC-47-13	1.0	4,975.00000	4,975.00
				These commodities, technology, or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S.law and applicable local export control is prohibited.			
				Line Item Total		*********	9,950.00

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT

Last Page	**Invoice Total**	9,950.00 **U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		06/21/16	I44295
Supplier No. 001-30	**Customer P.O. No.** Contract No. SC-47-13		Page Number 1

Ship to	Invoice to	Remit to
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	**Rockwell Automation Puerto Rico, Inc.** **Calle 1, Metro Office 6 Suite 304-Metro Office Park** **Guaynabo- PR**

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destine **Freight**

Shipped Date	Gross Weight	Net Weights	Status
06/21/2016	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	Progress Billing			System Operation & Maint Month 11 JUNE 2016	1.0	21,429.00	21,429.00
2	Progress Billing			Site Engineer - RA Month 11 JUNE 2016	1.0	14, 634.00	14, 634.00
3	Progress Billing			Training - Extended Scope Month 11 JUNE 2016	1.0	4,881.00	4,881.00
4	Progress Billing			Estmt Travel & Living Exps Month 11 JUNE 2016	1.0	4,975.00	4,975.00
				These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, and Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity. **Line Item Total**		*********	45,919.00

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE "FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"	Last Page	**Invoice Total**	45,919.00
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT			**U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		05/27/16	I43993
Supplier No. 001-30	**Customer P.O. No.** Contract No. SC-47-13		Page Number 1

Ship to	Invoice to	Remit to
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	**Rockwell Automation Puerto Rico, Inc.** **Calle 1, Metro Office 6 Suite 304-Metro Office Park** **Guaynabo- PR**

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destine **Freight**

Shipped Date	Gross Weight	Net Weights	Status
05/27/2016	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	Progress Billing			System Operation & Maint Month 10 MAY 2016	1.0	21,429.00	21,429.00
2	Progress Billing			Site Engineer - RA Month 10 MAY 2016	1.0	14, 634.00	14, 634.00
3	Progress Billing			Training - Extended Scope Month 10 MAY 2016	1.0	4,881.00	4,881.00
4	Progress Billing			Estmt Travel & Living Exps Month 10 MAY 2016	1.0	4,975.00	4,975.00
				These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, and Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity. **Line Item Total**		*********	45,919.00

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"	Last Page	**Invoice Total**	45,919.00
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT			**U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		04/28/16	I43640
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract No. SC-47-13		1

Ship to	Invoice to	Remit to
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	**Rockwell Automation Puerto Rico, Inc.** **Calle 1, Metro Office 6 Suite 304-Metro Office Park** **Guaynabo- PR**

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destine **Freight**

Shipped Date	Gross Weight	Net Weights	Status
04/28/2016	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	Progress Billing			System Operation & Maint Month 9 APRIL 2016	1.0	21,429.00	21,429.00
2	Progress Billing			Site Engineer - RA Month 9 APRIL 2016	1.0	14, 634.00	14, 634.00
3	Progress Billing			Training - Extended Scope Month 9 APRIL 2016	1.0	4,881.00	4,881.00
4	Progress Billing			Estmt Travel & Living Exps Month 9 APRIL 2016	1.0	4,975.00	4,975.00
				These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, and Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity. **Line Item Total**		*********	45,919.00

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"	Last Page	**Invoice Total**	45,919.00
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT			**U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		03/23/16	I43166
Supplier No. 001-30	**Customer P.O. No.** Contract No. SC-47-13		Page Number 1

Ship to	Invoice to	Remit to
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	**Rockwell Automation Puerto Rico, Inc.** **Calle 1, Metro Office 6 Suite 304-Metro Office Park** **Guaynabo- PR**

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destine **Freight**

Shipped Date	Gross Weight	Net Weights	Status
03/23/2016	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	Progress Billing			System Operation & Maint Month 8 March 2016	1.0	21,429.00	21,429.00
2	Progress Billing			Site Engineer - RA Month 8 March 2016	1.0	14, 634.00	14, 634.00
3	Progress Billing			Training - Extended Scope Month 8 March 2016	1.0	4,881.00	4,881.00
4	Progress Billing			Estmt Travel & Living Exps Month 8 March 2016	1.0	4,975.00	4,975.00
				These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, and Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity. **Line Item Total**		*********	45,919.00

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WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"	Last Page	**Invoice Total**	45,919.00
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT			**U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		02/24/16	I42835
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract No. SC-47-13		1

Ship to	Invoice to
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)

Remit to
Rockwell Automation Puerto Rico, Inc.
Calle 1, Metro Office 6 Suite 304-Metro Office Park
Guaynabo- PR

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destine **Freight**

Shipped Date	Gross Weight	Net Weights	Status
12/30/2015	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	Progress Billing			System Operation & Maint Month 7 February 2016	1.0	21,429.00	21,429.00
2	Progress Billing			Site Engineer - RA Month 7 February 2016	1.0	14, 634.00	14, 634.00
3	Progress Billing			Training - Extended Scope Month 7 February 2016	1.0	4,881.00	4,881.00
4	Progress Billing			Estmt Travel & Living Exps Month 7 February 2016	1.0	4,975.00	4,975.00
				These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, and Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity. **Line Item Total**		*********	45,919.00

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CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT			**U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		02/24/16	142833
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract SC-47-13		1 OF 1

Ship to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Invoice to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Remit to
Rockwell Automation Puerto Rico Inc.
Calle 1 Metro Office 6 Suite 304,Guaynabo Puerto Rico.

Sold to

Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Special Marks

Correspondence to

Payment Terms: 30 days
Shipped From
VIA
Delivery Terms Destino **Freight**

Shipped Date	Gross Weight	Net Weights	Status
02/24/2016	0.00	0.00	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	PROGRESS BILLING			PROGRESS BILLING (SSB) Origin: EXPENSES PO: Contract No. SC-47-13 P9830Y418 ADMINISTRATION & RETENTION COST PO: Contract No. SC-47-13 P9830Y418	1.0	37,469.03000	37,469.03
2	PROGRESS BILLING			PROGRESS BILLING (SSB) Origin: EXPENSES PO: Contract No. SC-47-13 P9830Y418 ADMINISTRATION & RETENTION COST PO: Contract No. SC-47-13 P9830Y418	1.0	1,972.05000	1,972.05

These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity.

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE "FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"

CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT

Invoice Total	XXXXXXXXXX U.S.DOLLARS

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		01/26/16	I42514
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract No. SC-47-13		1

Ship to	Invoice to
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)

Remit to
Rockwell Automation Puerto Rico, Inc.
Calle 1, Metro Office 6 Suite 304-Metro Office Park
Guaynabo- PR

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destine **Freight**

Shipped Date	Gross Weight	Net Weights	Status
01/26/2016	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	Progress Billing			System Operation & Maint Month 6 January 2016	1.0	21,429.00	21,429.00
2	Progress Billing			Site Engineer - RA Month 6 January 2016	1.0	14, 634.00	14, 634.00
3	Progress Billing			Training - Extended Scope Month 6 January 2016	1.0	4,881.00	4,881.00
4	Progress Billing			Estmt Travel & Living Exps Month 6 January 2016	1.0	4,975.00	4,975.00
				These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, and Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity. **Line Item Total**		*********	45,919.00

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"	Last Page	**Invoice Total**	45,919.00
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT			**U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		12/30/15	I42254
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract No. SC-47-13		1

Ship to	Invoice to	Remit to
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	**Rockwell Automation Puerto Rico, Inc.** **Calle 1, Metro Office 6 Suite 304-Metro Office Park** **Guaynabo- PR**

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P Authority PO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destine **Freight**

Shipped Date	Gross Weight	Net Weights	Status
12/30/2015	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	Progress Billing			System Operation & Maint Month 5 Dec 2015	1.0	21,429.00	21,429.00
2	Progress Billing			Site Engineer - RA Month 5 Dec 2015	1.0	14, 634.00	14, 634.00
3	Progress Billing			Training - Extended Scope Month 5 Dec 2015	1.0	4,881.00	4,881.00
4	Progress Billing			Estmt Travel & Living Exps Month 5 Dec 2015	1.0	4,975.00	4,975.00
				These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, and Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity. **Line Item Total**		*********	45,919.00

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"	Last Page	**Invoice Total**	45,919.00
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT			**U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		11/27/15	I41890
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract No. SC-47-13		1

Ship to	Invoice to	Remit to
Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	**Rockwell Automation Puerto Rico, Inc.** **Calle 1, Metro Office 6 Suite 304-Metro Office Park** **Guaynabo- PR**

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destino **Freight**

Shipped Date	Gross Weight	Net Weights	Status
11/27/2015	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	Progress Billing			System Operation & Maint Month 4 November 2015	1.0	21,429.00	21,429.00
2	Progress Billing			Site Engineer - RA Month 4 November 2015	1.0	14, 634.00	14, 634.00
3	Progress Billing			Training - Extended Scope Month 4 November 2015	1.0	4,881.00	4,881.00
4	Progress Billing			Estmt Travel & Living Exps Month 4 November 15	1.0	4,975.00	4,975.00
5	Progress Billing			Rockwell Automation will reduce by three days (2 142.90) due To technician absence.	-1.0	2,142.90	-2,142.90
				These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity.			
				Line Item Total		*********	43,776.10

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"	Last Page	**Invoice Total**	43,776.10
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT			**U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		10/28/15	I41610
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract		1

Ship to	Invoice to	Remit to
Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	**Rockwell Automation Puerto Rico, Inc.** **Calle 1, Metro Office 6 Suite 304-Metro Office Park** **Guaynabo- PR**

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destino **Freight**

Shipped Date	Gross Weight	Net Weights	Status
10/28/2015	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	Progress Billing			System Operation & Maint Month 3 October 2015	1.0	21,429.00	21,429.00
2	Progress Billing			Site Engineer - RA Month 3 October 2015	1.0	14, 634.00	14, 634.00
3	Progress Billing			Training - Extended Scope Month 3 October 2015	1.0	4,881.00	4,881.00

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		10/28/15	I41610
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract		2

Ship to	Invoice to	Remit to
Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	**Rockwell Automation Puerto Rico, Inc.** **Calle 1, Metro Office 6 Suite 304-Metro Office Park** **Guaynabo- PR**

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destino **Freight**

Shipped Date	Gross Weight	Net Weights	Status
10/28/2015	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
4	Progress Billing			Estmt Travel & Living Exps Month 1 August 2015	1.0	4,975.00	4,975.00
5	Progress Billing			Estmt Travel & Living Exps Month 2 September 2015	1.0	4, 975.00	4, 975.00
6	Progress Billing			Estmt Travel & Living Exps Month 3 October 2015	1.0	4,975.00	4,975.00
				These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity.		*********	55,869.00
				Line Item Total			

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"	Last Page	**Invoice Total**	55,869.00
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT			**U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		10/15/15	I41460
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract		1 OF 1

Ship to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Invoice to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Remit to
Rockwell Automation PR Inc.Calle 1 Metro Office Pa
Suite 304

Guaynabo - PR

Sold to

Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Special Marks

Correspondence to

Payment Terms: 30 days
Shipped From Rockwell Automation PR Inc.
VIA
Delivery Terms Destino **Freight**

Shipped Date	Gross Weight	Net Weights	Status
10/15/2015	0.00	0.00	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	PROGRESS BILLING			PROGRESS BILLING (SSB) Annual SW Maintenance Year 3 2015 Annual Cert Testing Year 3 2015 Procedures Year 3 2015	1.0	57,143.00000	57,143.00
2	PROGRESS BILLING			PROGRESS BILLING (SSB) Annual SW Maintenance Year 3 2015 Annual Cert Testing Year 3 2015 Procedures Year 3 2015	1.0	61,650.00000	61,650.00
3	PROGRESS BILLING			PROGRESS BILLING (SSB) Annual SW Maintenance Year 3 2015 Annual Cert Testing Year 3 2015 Procedures Year 3 2015	1.0	28,571.00000	28,571.00

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE "FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT

Invoice Total XXXXXXXXXX **U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		10/14/15	I41427
Supplier No.	**Customer P.O. No.**		Page Number
001-30	SC-47-13		1 OF 1

Ship to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Invoice to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Remit to
Rockwell Automation PR Inc.Calle 1 Metro Office Pa
Suite 304

Guaynabo - PR

Sold to

Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Special Marks

Correspondence to

Payment Terms: 30 days
Shipped From Rockwell Automation PR Inc.
VIA
Delivery Terms Destino **Freight**

Shipped Date	Gross Weight	Net Weights	Status
10/14/2015	0.00	0.00	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	PROGRESS BILLING			PROGRESS BILLING (SSB) P9830Y418 VIRGIN ISLAND W&O AUTHORITY PO: SC-47-13 ADDENDUM IV ADDITIONAL EXPENSES AND OVERTIME $63,047.00 USD These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity.	1.0	63,047.00000	63,047.00
				Line Item Total		*********	63,047.00

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT

Last Page	**Invoice Total**	63,047.00 **U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		08/28/15	I40858
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract No. SC-47-13		1

Ship to	Invoice to	Remit to
Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	**Rockwell Automation Puerto Rico, Inc.** **Calle 1, Metro Office 6 Suite 304-Metro Office Park** **Guaynabo- PR**

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destino **Freight**

Shipped Date	Gross Weight	Net Weights	Status
08/28/2015	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	Progress Billing			System Operation & Maint Month 1 August 2015	1.0	21,429.00	21,429.00
2	Progress Billing			Site Engineer - RA Month 1 August 2015	1.0	14, 634.00	14, 634.00
3	Progress Billing			Training - Extended Scope Month 1 August 2015	1.0	4,881.00	4,881.00
				These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity.			
				Line Item Total		*********	40,944.00

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"	Last Page	**Invoice Total**	40,944.00
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT			**U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		08/24/15	I40789
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract No. SC-47-13		1

Ship to	Invoice to	Remit to
Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)	**Rockwell Automation Puerto Rico, Inc.** **Calle 1, Metro Office 6 Suite 304-Metro Office Park** **Guaynabo- PR**

Sold to	Special Marks	Payment Terms: 30 days
Virgin Islands W&P AuthorityPO BOX 1450 St. Thomas - - VIRGIN ISLANDS (U.S.)		Shipped From
		VIA
	Correspondence to	**Delivery Terms** Destino **Freight**

Shipped Date	Gross Weight	Net Weights	Status
08/24/2015	**********	**********	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	Progress Billing			System Operation & Maint Month 12 July 2015	1.0	21,429.00	21,429.00
2	Progress Billing			Site Engineer - RA Month 12 July 2015	1.0	14, 634.00	14, 634.00
3	Progress Billing			Training - Extended Scope Month 12 July 2015	1.0	4,881.00	4,881.00
				These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity.		*********	40,944.00
				Line Item Total			

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"	Last Page	**Invoice Total**	40,944.00
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT			**U.S.DOLLARS**

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		08/19/15	I40743
Supplier No.	**Customer P.O. No.**		Page Number
001-30	Contract		1 OF 1

Ship to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Invoice to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Remit to
Rockwell Automation PR
Calle 1 Metro Office 6 Suite 304, Guaynabo PR

Sold to

Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Special Marks

Correspondence to

Payment Terms: 30 days
Shipped From
VIA
Delivery Terms Destino **Freight**

Shipped Date	Gross Weight	Net Weights	Status
08/19/2015	0.00	0.00	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	PROGRESS BILLING			PROGRESS BILLING (SSB) System Operation & Maint Month 7 February 2015 Site Engineer - RA Month 7 February 2015	1.0	21,429.00000	21,429.00
2	PROGRESS BILLING			PROGRESS BILLING (SSB) Site Engineer-RA Month 7 February 2015 Site Engineer - RA Month 7	1.0	14,634.00000	14,634.00

These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, Republic of the Sudan, Syria or any other country where shipment is prohibited;or to end-user(r) involved in chemical,biological,nuclear or missile weapons activity.

APPENDIX B

ADDITIONAL TRAVEL EXPENSES FOR TRAINING REQUESTED BY ROCKWELL/QA

Virgin Islands Water and Power Authority

P.O. Box 1450, St. Thomas, VI 00804
Phone: 340-774-3552, Fax 340-7763896
www.viwapa.vi

PURCHASE ORDER

PURCHASE ORDER NO. 067580

DATE: 03/18/2016

VENDOR ADDRESS:
ROCKWELL AUTOMATION CARIBBEAN
PO BOX 5180
AGUADILLA, PR 00605

SHIP TO:
STT-ENVIRONMENTAL DEPT.
ENVIRONMENTAL DEPARTMENT
P.O. BOX 1450
#18 SUB BASE
ST. THOMAS, VI 00804

Our P.O. # MUST Appear on ALL Invoices, Packages and Correspondence

VENDOR #	DELIVER BY	SHIP VIA	FOB	TERMS .		
10972	05/16/2016	VENDOR SERVICE	PR	SEE BELOW		
BUYER		**EXPEDITER ASSIGNED**		**REQUISITION BY**		
TYSHA LEE CARTY		TYSHA LEE-CARTY		MAXWELL GEORGE		
FREIGHT		**ACCOUNT NUMBER**		**PROJECT**	**REQ #**	**REQ DATE**
		20052008124415			0000030649	04/07/2015

ITEM #	QUANTITY/ UNIT	DESCRIPTION ARTICLE OR SERVICE	UNIT COST	EXTENDED COST
		CHANGE ORDER		
1	1.00 / EA	TRAINING EXEXPENSE (JAN - MAR)	53,153.0000	53,153.00
		REFERENCE TO FIXED PRICE PROPOSAL: **14-0617-VIW-06A-M **DATED: 10/15/2014 *SEE ATTACHED		
0		NET 30 DAYS E-MAIL INVOICES TO ACCOUNTSPAYABLE@VIWAPA.VI REF: PROPOSAL 14-0617-VIW-06A-M-REV.B GENERAL CONTRACT TERMS ATTACHED		

TOTAL PURCHASE AMOUNT **$53,153.00**

Send Original and One Copy of Invoice to:
ATTN: Accounts Payable, VIWAPA
P.O. Box 1450
St. Thomas, USVI 00804
accountspayable@viwapa.vi
Vendor Tax ID# Must Accompany All Invoices

AUTHORIZED SIGNATURE _____
Purchasing Manager

Rockwell Automation

Customer ID	JOB Number	Invoice Date	Invoice No.
10000248		03/30/16	I43248
Supplier No.	**Customer P.O. No.**		**Page Number**
001-30	067580		1 OF 1

Ship to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Invoice to
Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Remit to
Rockwell Automation Puerto Rico Inc
Calle 1 Metro Office 6 Suite 304, Guaynabo PR

Sold to

Virgin Islands W&P AuthorityPO BOX 1450

St. Thomas - - VIRGIN ISLANDS (U.S.)

Special Marks

Correspondence to

Payment Terms: 30 days
Shipped From
VIA
Delivery Terms Destino **Freight**

Shipped Date	Gross Weight	Net Weights	Status
03/30/2016	0.00	0.00	Total

Item No.	Catalog Number	Ser	Release	Description	Quantity Shipped	Net Price	Extended Amount
1	PROGRESS BILLING			PROGRESS BILLING (SSB) 100% WITH PURCHASE ORDER PO: 067580 P9830Y418 These commodities, technology or software are subject to the United States Export Administration Regulations. Diversion contrary to U.S. law and other relevant export controls is prohibited. They may not be shipped to Cuba, Iran, Republic of the Sudan, Syria or any other country where shipment is prohibited; or to end-use(r) involved in chemical, biological, nuclear, or missile weapons activity.	1.0	53,153.00000	53,153.00
				Line Item Total		*********	53,153.00

WE HEREBY CERTIFY THAT WE ARE COMPLYING WITH REQUIREMENTS OF THE " FAIR LABOR STANDARDS ACT OF 1938 AS AMENDED"
CERTIFIED CORRECT - ROCKWELL AUTOMATION, INC BY: INTERNATIONSL CORRESPONDENT

Last Page | **Invoice Total** | 53,153.00 **U.S.DOLLARS**

APPENDIX C

FIRST INVOICE DATED FEBRUARY 17, 2017 WITH ALL APPENDED MATERIAL

DRAFT

VIRGIN ISLANDS
WATER
AND POWER
AUTHORITY

P.O. BOX 1450
ST. THOMAS, USVI
U.S. VIRGIN ISLANDS 00804-1450
TELEPHONE: (340) 774-3552
FAX: (340) 774-3422

March 3, 2016

Mr. Fermin Rodriguez
HOVENSA Special Consultant
FR Consulting LLC
Calle Sol. A-6
Puertas del Sol
Fijardo, PR 00738

Re: First Request for Reimbursement of Training Service Costs per the Supplemental Environmental Project (SEP) under the HOVENSA Consent Decree

Dear Mr. Rodriguez:

This is our first request for reimbursement of the training costs allowed under the HOVENSA Consent Decree SEP. We appreciate the assistance you and HOVENSA have provided the Virgin Islands Water and Power Authority (WAPA) in delineating the information needed to recover training costs for the continuous emissions monitoring systems (CEMS) at our two generating stations that WAPA has incurred and will incur over the next several years. Based on the teleconference in August, the September meeting with me and Michael Lukey from ARCADIS, our consultant, and the recent discussions you and I have had by phone, we have assembled a number of documents that support our requested reimbursement for training costs through July 2015.

As you know Rockwell Automation is the contractor that has provided WAPA with monitor updates and has trained our staff in special classroom training sessions and in routine on-site training through its field technician. I understand that you were previously given a copy of the contract between WAPA and Rockwell and are aware of the provisions described in Section 2.4 of the proposal/contract.

The initial round of class room training has been completed for all CEMS technicians and managers. We are providing a copy of the training materials and list of class room participants with this submittal. Another round of classroom training is taking place early this month. We have advised you of these sessions and expect your participation. The on-site training has been underway from the time the Rockwell field technician arrived at the plant more than two years ago. The charges for the on-site training from Rockwell are prorated at each billing. We will explain how that is handled later.

At the September 24, 2015 meeting you asked us to provide you with the following:

- an organization chart of the WAPA Environmental Department that identifies the names of the individuals who received the training (Appendix A),
- names of the specific individuals who attended the training sessions and the times the classroom training was given (Appendix B),
- a copy of the training materials used by Rockwell and their subcontractor QA Support (Appendix C),
- a spreadsheet summarizing the training costs that have been billed to and paid by WAPA since contract inception (Appendix D), and
- the travel costs WAPA was charged that were specifically associated with the classroom training and the on-site training (Appendix D).

A summary of all costs we believe are reimbursable under the SEP is attached to this letter prior to the appendices listed above.

We would like to provide some additional explanation of the costs identified in Appendix D. The invoices presented to WAPA show the exact same amount ($4,881) for each month related to training. The contract with Rockwell is fixed price and the cost for the special extended training services is spread evenly over the 36-month contract life. The line item cost for the special training is $175,713 over the 36-month period or about $4,881 per month. We have accepted and paid for those services according to the terms of the fixed-price contract we have with Rockwell. We hope that you will accept this proportional method of invoicing the training costs. In addition, Rockwell has provided supporting time sheet information for its on-site personnel as well as those conducting the training. Please advise us if you want to review that supporting time sheet data and we will send it to you on a thumb drive.

That portion of the travel costs for the on-site technician while he offered training to our staff has been proportioned from the total travel budget for the on-site technician. We have enclosed the Rockwell description as to how it allocated those charges in Appendix D.

You also requested a schedule for the upcoming classroom training events, which is shown in Appendix E. Of course, you are invited and expected to attend each of these training sessions that will be held at the plant conference/training area in each plant.

We will continue to provide similar requests for reimbursement with the appropriate documentation through the life of the contract with Rockwell. Please send reimbursements to:

Julio Rhymer
Chief Financial Officer
Virgin Islands Water and Power Authority
P.O. Box 1450
St Thomas, USVI 00804-1450

Phone: (340) 774-3552
E-mail:rhymerja@viwapa.vi

We greatly appreciate your assistance with this effort. Please feel free to call me if you have any questions.

Yours truly,

Maxwell A. George
Environmental Affairs Manager
Virgin Islands Water and Power Authority

Enclosures

cc: Julio Rhymer
Greg Rhymer
Kevin Smalls

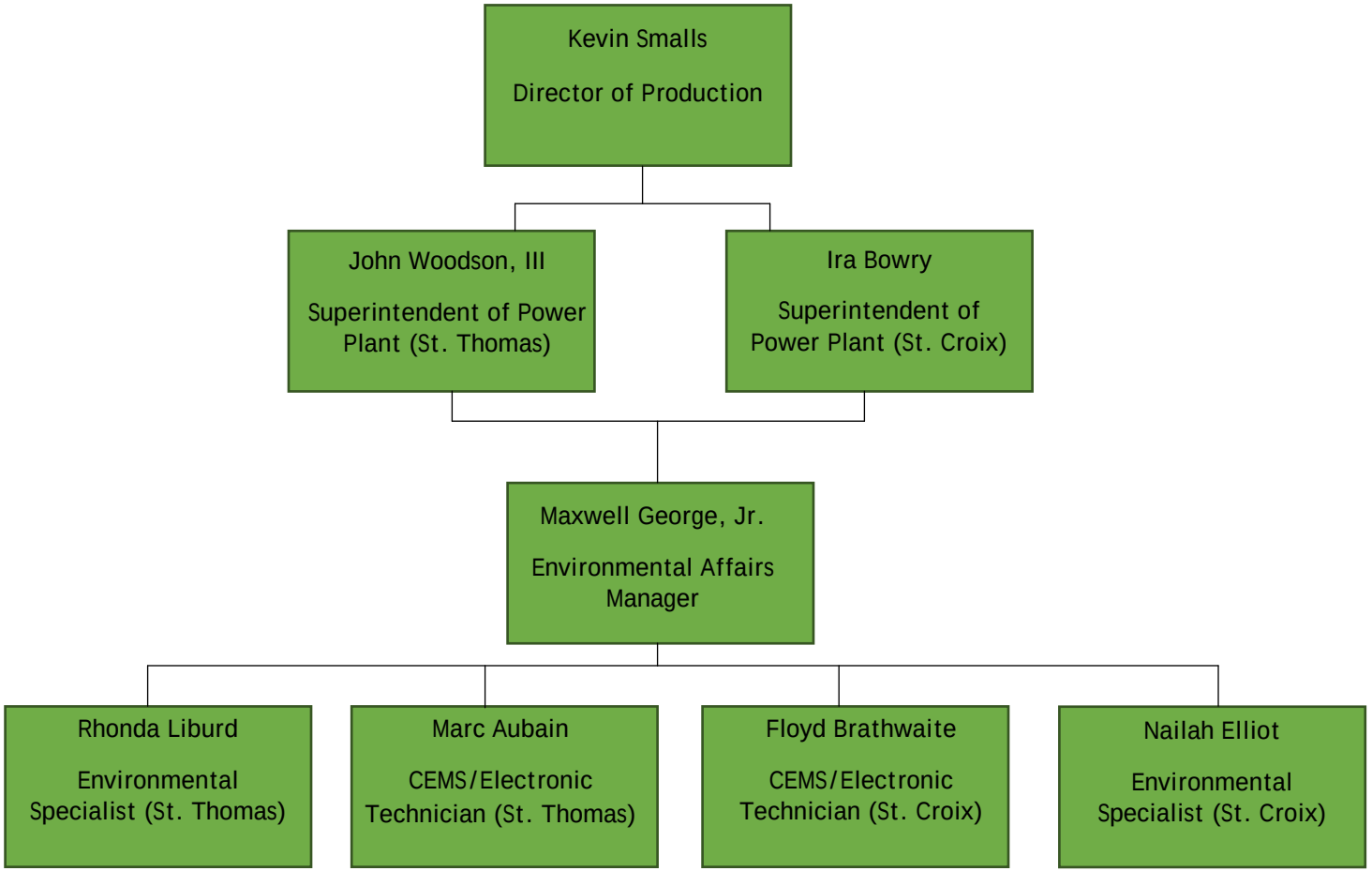
SUMMARY OF CONTINUOUS EMISSIONS MONITORING SYSTEMS TRAINING COSTS

Classroom and on-site training Invoiced inception through July 2015 (see detail of each invoice attached, Appendix D, Tab #1); total to end of Contract will be $175,713.	$112,263
Documented Change Request for time and travel expenses for classroom training (see Appendix D).	41,647
Travel expenses for on-site training activities prorated from total travel costs for on-site technician (see estimate provided by Rockwell in Appendix D, Tab #2).	65,940
Rockwell/QA professional time to develop the Procedures (QAP) for operating the CEMS/COMS (see Appendix D, Tab #4).	57,142
Rockwell/QA professional time for development and maintenance of spare parts inventory for CEMS/COMS (based on estimates provided by Rockwell, see Appendix D, Tab #3)	37,680
TOTAL	**$314,672**

APPENDIX A

ORGANIZATION CHART OF WAPA ENVIRONMENTAL DEPARTMENT

VIWAPA Organizational Chart



APPENDIX B

SUBJECT MATTER, DATES AND INDIVIDUALS TRAINED

Rockwell Automation

PROJECT STATUS REPORT			
Document Title:	VIWAPA Year 1 & 2 Classroom Training Report		
Date Modified:		Revision:	V1.0.10
Revision Note:	N/A		
IFS Document #:		Alt Doc #:	

PROJECT INFORMATION	
Project Number:	P9830Y418
Project Name:	CEMS / DAHS Environmental Solution Project
Project Manager:	Jonathan Rivera Tirado

1. Activities/Deliverables During This Period

ITEM	Topic	Module	Instructor	Date	Location	# of attendees	Names
1	Year 1 CEM/COM System Training	Analytical Theory	Daren Humphries	Ongoing	STT/STX	2	Floyd Brathwaite Marc Aubain
2	Year 1 CEM/COM System Training	System Operation	Tom Barnhart Ray Fain	2/17/2014-2/20/2014	STT Video Conf STX	6	Rhonda Liburd Rene de Jongh Floyd Brathwaite Marc Aubain Arcadis RA
3	Year 1 CEM/COM System Training	System Maintenance	Tom Barnhart Ray Fain	2/17/2014-2/20/2014	STT Video Conf STX	6	Rhonda Liburd Rene de Jongh Floyd Brathwaite Marc Aubain Arcadis RA

PROJECT STATUS REPORT			
Document Title:	VIWAPA Year 1 & 2 Classroom Training Report		
Date Modified:		Revision:	V1.0.10
Revision Note:	N/A		
IFS Document #:		Alt Doc #:	

	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
4	Year 1 CEM/COM Systems Regulations Training	Regulations Overview	Marsha Layman	12/11/2013-12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
5	Year 1 CEM/COM Systems Regulations Training	NSPS Introduction / General Requirements	Marsha Layman	12/11/2013 - 12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
6	Year 1 CEM/COM Systems Regulations Training	Review of Facility-Specific Permits	Marsha Layman	12/11/2013 - 12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
7	Year 1 CEM/COM Systems Regulations Training	Monitoring Fundamentals	Marsha Layman	12/11/2013 - 12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh

PROJECT STATUS REPORT			
Document Title:	VIWAPA Year 1 & 2 Classroom Training Report		
Date Modified:		Revision:	V1.0.10
Revision Note:	N/A		
IFS Document #:		Alt Doc #:	

	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
8	Year 1 CEM/COM Systems Regulations Training	Ongoing QA/QC Procedures	Marsha Layman	12/11/2013-12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
9	Year 1 CEM/COM Systems Regulations Training	Part 60 - Hourly Validation	Marsha Layman	12/11/2013-12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
10	Year 1 CEM/COM Systems Regulations Training	Part 60 - Calculating Emissions	Marsha Layman	12/11/2013-12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
11	Year 1 CEM/COM Systems Regulations Training	Part 60 - Recordkeeping Requirements	Marsha Layman	12/11/2013 - 12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh

PROJECT STATUS REPORT			
Document Title:	VIWAPA Year 1 & 2 Classroom Training Report		
Date Modified:		Revision:	V1.0.10
Revision Note:	N/A		
IFS Document #:		Alt Doc #:	

	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
12	Year 1 CEM/COM Systems Regulations Training	Reporting Requirements	Marsha Layman	12/11/2013 - 12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
13	Year 1 CEM/COM Systems Regulations Training	Part 60 - Subpart D	Marsha Layman	12/11/2013-12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
14	Year 1 CEM/COM Systems Regulations Training	Part 60 Subpart - Da	Marsha Layman	12/11/2013-12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
15	Year 1 CEM/COM Systems Regulations Training	Part 60 Subpart - Db	Marsha Layman	12/11/2013-12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh

PROJECT STATUS REPORT			
Document Title:	VIWAPA Year 1 & 2 Classroom Training Report		
Date Modified:		Revision:	V1.0.10
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	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
16	Year 1 CEM/COM Systems Regulations Training	Part 60 Subpart - GG	Marsha Layman	12/11/2013-12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
17	Year 1 CEM/COM Systems Regulations Training	Part 60 Subpart - KKKK	Marsha Layman	12/11/2013-12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
18	Year 1 CEM/COM Systems Regulations Training	Part 60 - QA/QC for CEMS	Marsha Layman	12/11/2013 - 12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
19	Year 1 CEM/COM Systems Regulations Training	Part 75 - QA/QC for Fuel Flow meter Systems	Marsha Layman	12/11/2013-12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh

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	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
20	Year 1 CEM/COM Systems Regulations Training	Part 75 - Appendix G	Marsha Layman	12/11/2013-12/12/2013	STT	3	Marc Aubain Rhonda Liburd Rene de Jongh
21	Year 1 QA Advantage Environmental Reporting Software System Training	General Data Flow and System Architecture	Tom Barnhart Ray Fain	2/17/2014-2/20/2014	STT Video Conf STX	6	Rhonda Liburd Rene de Jongh Floyd Brathwaite Marc Aubain Arcadis RA
22	Year 1 QA Advantage Environmental Reporting Software System Training	QA Emission Point Advantage	Tom Barnhart Ray Fain	2/17/2014-2/20/2014	STT Video Conf STX	6	Rhonda Liburd Rene de Jongh Floyd Brathwaite Marc Aubain Arcadis RA

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	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
23	Year 1 QA Advantage Environmental Reporting Software System Training	QA Site and Enterprise Advantage	Tom Barnhart Ray Fain	2/17/2014-2/20/2014	STT Video Conf STX	6	Rhonda Liburd Rene de Jongh Floyd Brathwaite Marc Aubain Arcadis RA
24	Year 2 CEM/COM System Training	Analytical Theory					
25	Year 2 CEM/COM System Training	System Operation					
26	Year 2 CEM/COM System Training	System Maintenance					

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	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
27	Year 2 CEM/COM Systems Regulations Training	Regulations Overview	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
28	Year 2 CEM/COM Systems Regulations Training	NSPS Introduction / General Requirements	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
29	Year 2 CEM/COM Systems Regulations Training	Review of Facility-Specific Permits	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
30	Year 2 CEM/COM Systems Regulations Training	Monitoring Fundamentals	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite

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	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
31	Year 2 CEM/COM Systems Regulations Training	Ongoing QA/QC Procedures	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
32	Year 2 CEM/COM Systems Regulations Training	Part 60 - Hourly Validation	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
33	Year 2 CEM/COM Systems Regulations Training	Part 60 - Calculating Emissions	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
34	Year 2 CEM/COM Systems Regulations Training	Part 60 - Recordkeeping Requirements	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite

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	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
35	Year 2 CEM/COM Systems Regulations Training	Reporting Requirements	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
36	Year 2 CEM/COM Systems Regulations Training	Part 60 - Subpart D	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
37	Year 2 CEM/COM Systems Regulations Training	Part 60 Subpart - Da	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
38	Year 2 CEM/COM Systems Regulations Training	Part 60 Subpart - Db	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite

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	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
39	Year 2 CEM/COM Systems Regulations Training	Part 60 Subpart - GG	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
40	Year 2 CEM/COM Systems Regulations Training	Part 60 Subpart - KKKK	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
41	Year 2 CEM/COM Systems Regulations Training	Part 60 - QA/QC for CEMS	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
42	Year 2 CEM/COM Systems Regulations Training	Part 75 - QA/QC for Fuel Flow meter Systems	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite

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	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
43	Year 2 CEM/COM Systems Regulations Training	Part 75 - Appendix G	Marsha Layman	11/17/2014-11/18/2014	STX	3	Nailah Elliott Floyd Brathwaite
44	Year 2 QA Advantage Environmental Reporting Software System Training	General Data Flow and System Architecture	TBD	TBD	TBD	TBD	TBD
45	Year 2 QA Advantage Environmental Reporting Software System Training	QA Emission Point Advantage	TBD	TBD	TBD	TBD	TBD

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	1. Activities/Deliverables During This Period						
ITEM	**Topic**	**Module**	**Instructor**	**Date**	**Location**	**# of attendees**	**Names**
46	Year 2 QA Advantage Environmental Reporting Software System Training	QA Site and Enterprise Advantage	TBD	TBD	TBD	TBD	TBD

Notes:

1) DAHS Training for STX in Year 1 was supposed to be scheduled by the site due to not having dates agreed by VIWAPA. STX was completed via video conference from STT. Maxwell George did not supply additional dates for QAS to return.

2) Analyzer classroom training was attempted during installation/startup/commissioning in year one but no dates were ever set by VIWAPA. Daren Humphries completed this during hands on training with available technicians

APPENDIX C

TRAINING MATERIALS FOR CLASSROOM TRAINING

APPENDIX C.1

VIRGIN ISLANDS WATER & POWER AUTHORITY
REGULATIONS TRAINING MODULES

Modules and Topics

Regulations Overview

- Discuss difference between laws and regulations
- Discuss the origin and purpose of the NSPS program
- Identify the common NSPS subparts and appendices

NSPS – General Requirements

- Orient students to the organization of the regulations and citation nomenclature
- Examine Subpart A in detail, including:
  - Definitions
  - Notification requirements
  - Recordkeeping requirements
  - Requirements if monitoring is used
  - Initial certification testing – what tests are performed, and what are the performance specifications
  - How calibration checks are performed, and the performance specifications for this test
  - Hourly data validation
  - Reporting requirements – includes a written exercise in reading an EER
  - General provisions
- For applicable industry-specific subparts (GG and KKKK), identify:
  - Applicability
  - Which parameters have emissions limits?
  - What compliance options exist?
  - What continuous monitoring is required, and what subpart-specific rules exist for data validity, data averaging, and multi-hour averaging?
  - How are instrument spans established?
  - What fuel sampling or parametric monitoring is needed?
  - What are the recordkeeping and reporting requirements?
- Also:
  - What is a 'boiler operating day'? What is a 'steam generating unit operating day'?
  - What are the definitions for 'startup,' 'shutdown,' and 'malfunction'?
  - Need to demonstrate compliance with removal requirements
  - Requirements for monitor availability

Review of Facility-Specific Permits

- Discuss the issue date and term of the current permit
- Identify the units and activities each permit covers

- Discover the emission limits each permit specifies
- Identify the operating limits each permit specifies
- Identify testing requirements
- Identify reporting requirements

Monitoring Fundamentals

- Discuss how emissions are calculated, where equations are located, how to use conversion constants, and an explanation of fuel factors
- Identify types of sampling methodologies, i.e., extractive systems vs. in-situ systems and dry extractive systems vs. wet extractive and specify which are used in this installation
- Explore various averaging intervals; clarify the difference between a block average and a rolling average; discuss the need to be precise in defining the composition of the averages
- Discuss he importance of proper rounding
- This module Includes a written exercise in taking raw emissions data, identifying the correct equation for yielding the reported value, then calculating that value
- Discuss the use of the diluent cap
- Discuss data validation requirements
- Ongoing QA/QC for monitoring systems, including how CGAs and RATAs are conducted and the performance specifications for those tests

Ongoing QA/QC procedures

- Calibration error tests
  - Discuss how the test is executed and how success is determined
- Cylinder gas audits
  - Discusses how the test is executed and how success is determined
  - Identify the allowed test exemption
  - This module includes a written exercise in evaluating a set of injections to calculate the amount of test error and determine the success of the test
  - Discuss handling of aborted or partial tests
- RATAs
  - Discuss how the test is executed and how success is determined
  - Discuss the test frequencies
  - Identify the allowed test exemption
- Detail how a 7-day calibration error drift test is performed and how success is determined
- Detail how a cycle time test is performed and how success is determined
- Recertification requirements - includes an exploration of the use of Acid Rain Program Policy Question 13.21

- Opacity tests
  - Current requirements
  - Proposed regulations

Recordkeeping Requirements

- Identify basic requirements for data retention
- Specify the types of data required to be kept
- Understand QA/QC plan requirements

Reporting Requirements

- Excess Emissions and Monitoring Performance reports
  - Discuss which data may be hand-entered or adjusted
  - Identify the components of the report and how data is coded in order to appear on the report
  - Discuss the certification statements submitted in a report
  - This module includes a written exercise in which an EER is evaluated
- Title V compliance reports
  - Identify the elements of the report
  - Expound upon the concept that each permit condition must be certified as either "in compliance" or "not in compliance"
- Deviation reporting

Other Topics

- Discuss the elements of a 10-step program for CEMS success

APPENDIX C.2

VIWAPA REGULATORY REVIEW

Revised 09/27/2013

Introduction

The purpose of this document is to describe the regulatory-related details to be configured in the DAHS. The entire document should be reviewed carefully, but special attention must be paid to items marked in red, as those items tend to be more variable in user-definition, and therefore may require modification. This document must be kept current. If information changes either during the configuration or any time afterward, this document must be adjusted.

PROGRAMS AFFECTING THESE SOURCES

VIWAPA generating facilities are subject to the air programs indicated below:

Facility	Units	Program
Estate Richmond Power Plant (St. Croix)	16, 17, 19, 20	NSPS Subpart GG
	10, 11	PSD
Randolph Harley Power Plant (St. Thomas)	15, 18, 22, 23	NSPS Subpart GG
	25	NSPS Subpart KKKK

CONTINUOUS MONITORING

Continuous emissions monitoring systems are required for measuring NO_x, O_2, and CO. The CEMS used at these facilities are detailed in Tables 2.a. and 2.b. below. All systems are dry-extractive type.

Table 2.a. Listing of CEMS in Use – Estate Richmond Power Plant (St. Croix)

	CEMS or Parametric Monitoring Required				
Unit	NO_x	O_2	CO	Opacity	Water:Fuel Ratio
16 (SC or CC w/20 to HRSG 24)	✓	✓	✓	✓	
17 (SC or CC to HRSG 21)	✓	✓	✓	✓	✓
19 (SC)	✓	✓	✓	✓	✓
20 (SC or CC w/16 to HRSG 24)	✓	✓	✓	✓	
21 (HRSG w/17)	✓	✓	✓	✓	
24 (HRSG w/17 & 20)	✓	✓	✓	✓	

Table 2.b. Listing of CEMS in Use – Randolph Harley Power Plant (St. Thomas)

	CEMS or Parametric Monitoring Required				
Unit	NO_x	O_2	CO	Opacity	Water:Fuel Ratio
11 (boiler)				✓	
15 (SC or CC w/18 to HRSG 21)	✓	✓	✓	✓	✓
18 (SC or CC w/15 to HRSG 21)	✓	✓	✓	✓	✓
21 (HRSG w/15 & 18)	✓	✓	✓	✓	✓
22 (CT)	✓	✓	✓	✓	✓
23 (CT)	✓	✓	✓	✓	✓
25 (CT)	✓	✓	✓	✓	✓

Certified fuel flowmeter systems exist for estimating:

- SO_2 (mass)
- CO_2 (mass)

- Heat input (mmBtu/hour)

Oil fuel flowmeters measure fuel flow rate in units of gallons/hour. At some future date, propane gas fuel and pipeline-quality natural gas fuel will be added, and will replace fuel oil as the primary fuel.

OPERATIONAL AND EMISSION LIMITS

Tables 3.a. and 3.b. below detail the operational and emission limits for the two facilities. Parameters and their accompanying limits for which a Part 60 Excess Emissions Report must be generated are shown in green highlight, as identified by VIWAPA.

Table 3.a. Operational and Emission Limits For Estate Richmond Power Plant (St. Croix)

Unit	Parameter	Limit	Notes	Interval
16	Fuel consumption	21,199,200 gallons/year		365-day rolling total
	Fuel consumption	2,420 gallons/hour		1-hour average
	Heat input	338.8 mmBtu/hour	Calculate by multiplying hourly fuel use by 140,000 Btu/gallon	1-hour average
	Operation	At ≤35% capacity	25% of total operating time	12-month rolling total
	Water injection	On at all times except SU/SD (load ≤35% capacity)		1-hour average
	Water-to-fuel ratio	≥ ratio established during initial testing	When operating at 35% load or higher	1-hour average
	SO_2	67.8 lbs/hour	When operated at SC mode or independently in CC mode	1-hour average
	SO_2	132 lbs/hour	When operated w/Unit 20 in CC mode	1-hour average
	NO_x	126.4 lbs/hour	When operated w/o Unit 20	1-hour average
	NO_x	229.4 lbs/hour	When operated w/Unit 20	1-hour average
	NO_x	75 ppmvdc @ 15% O_2	When operating above low load and when N is ≤150 ppm; Subpart GG	4-hour rolling average

			limit	
16, cont'd	NO_x	75 ppmvdc @ 15% O_2 + 0.04 x N	When operating above low load and when N is >150 ppm; Subpart GG limit	4-hour rolling average
	NO_x	55 ppm @ 15% O_2 if nitrogen content of fuel oil is ≤150 ppm	When operating above low load (>35% capacity)	1-hour average
	NO_x	Calculated limit = 55 ppm + [((N/10,000) -0.015) * 470.59] if nitrogen content of fuel oil is >150 ppm	When operating above low load (>35% capacity)	1-hour average
	NO_x	NO_x ppm from above, used in equation to calculate NO_x lbs/hr limit. N sampling done daily; calculated limit in effect for that day.	When fuel nitrogen content is >1,000 ppmw and unit is operating above low load.	1-hour average
	CO	37.3 lbs/hour	When operated at SC mode or independently in CC mode, at base load	1-hour average
	CO	352.3 lbs/hour	When operated w/Unit 20	1-hour average
	CO	2,947 ppmvd @15% O_2	When operating 0 to <6 MW	1-hour average
	CO	1,530 ppmvd@15% O_2	When operating >6 to 12 MW	1-hour average
	CO	593 ppmvd @15% O_2	When operating >12 to 17 MW	1-hour average
	CO	204 ppmvd @15% O_2	When operating >17 to 23 MW	1-hour average
	CO	51 ppmvd @15% O_2	When operating >23 to Max MW	1-hour average
	NO_x, CO, O_2	90% PMA		Calendar quarter
	Opacity	17%	Except for 3 (cherry-picked) minutes in any 30-minute rolling period, during which 40% is the limit. Do not report discarded minutes.	1-minute average

16, cont'd	Opacity	20%		1 minute average
	Opacity	95% PMA		Calendar quarter
17	Fuel consumption	21,024,000 gallons/year		365-day rolling total
	Fuel consumption	2,420 gallons/hour		1-hour average
	Heat input	336 mmBtu/hour	Calculate by multiplying hourly fuel use by 140,000 Btu/gallon	1-hour average
	Operation	At ≤35% capacity	25% of total operating time	12-month rolling total
	Water injection	On at all times except SU/SD (load ≤35% capacity)		1-hour average
	NO_x	104.3 lbs/hour	When operated w/o Unit 21	1-hour average
	NO_x	229.4 lbs/hour	When operated w/Unit 21	1-hour average
	Water-to-fuel ratio	≥ ratio established during initial testing	When operating at 35% load or higher	1-hour average
	SO_2	67.2 lbs/hour	When operated at SC mode or independently in CC mode	1-hour average
	NO_x	42 ppm @ 15% O_2 if nitrogen content of fuel oil is ≤150 ppm	When operating above low load (>35% capacity); Subpart GG limit	4-hour rolling average
	NO_x	Calculated limit = 42 ppm + [((N/10,000)-0.015) * 470.59] if nitrogen content of fuel oil is >150 ppm	When operating above low load (>35% capacity); Subpart GG limit	4-hour rolling average
	NO_x	NO_x ppm from above, used in equation to calculate NO_x lbs/hr limit. N sampling done daily; calculated limit in effect for that day.	When fuel nitrogen content is >1,000 ppmw and unit is operating above low load	1-hour average

17, cont'd	NO_x	75 ppmvdc @ 15% O_2	When operating above low load and when N is ≤150 ppm; Subpart GG limit	4-hour rolling average
	NO_x	75 ppmvdc @ 15% O_2 + 0.04 x N	When operating above low load and when N is >150 ppm; Subpart GG limit	4-hour rolling average
	CO	2,196 ppmvd@15% O_2	When operating 0 to <6 MW	1-hour average
	CO	1,140 ppmvd @15% O_2	When operating >6 to <12 MW	1-hour average
	CO	442 ppmvd @15% O_2	When operating >12 to <17 MW	1-hour average
	CO	152 ppmvd @15% O_2	When operating >17 to <23 MW	1-hour average
	CO	38 ppmvd @15% O_2	When operating >23 to Max MW	1-hour average
	CO	352.3 lbs/hour	When operated w/Unit 20	1-hour average
	NO_x, CO, O_2	90% PMA		Calendar quarter
	Opacity	17%	Except for 3 (cherry-picked) minutes in any 30-minute rolling period, during which 40% is the limit. Do not report discarded minutes.	1-minute average
	Opacity	20%		1 minute average
	Opacity	95% PMA		Calendar quarter
19	Fuel consumption	19,885,200 gallons/year		365-day rolling total
	Fuel consumption	2,270 gallons/hour		1-hour average
	Heat input	317.8 mmBtu/hour	Calculate by multiplying hourly fuel use by 140,000 Btu/gallon	1-hour average
	Operation	At ≤35% capacity	25% of total operating time	12-month rolling total
	Operation	At <15% capacity	Any 8-hour period	Any 8-hour period
	Water injection	On at all times except SU/SD (load ≤35% capacity)		1-hour average

19, cont'd	Water-to-fuel ratio	≥ ratio established during initial testing	When operating at 35% load or higher	1-hour average
	SO_2	63.5 lbs/hour		1-hour average
	NO_x	1,031 lbs/hour		1-hour average
	NO_x	42 ppm @ 15% O_2 if nitrogen content of fuel oil is ≤150 ppm	When operating above low load (>35% capacity)	1-hour average
	NO_x	Calculated limit = 42 ppm + [((N/10,000)-0.015) * 470.59] if nitrogen content of fuel oil is >150 ppm	When operating above low load (>35% capacity)	1-hour average
	NO_x	NO_x ppm from above, used in equation to calculate NO_x lbs/hr limit. N sampling done daily; calculated limit in effect for that day.	When fuel nitrogen content is >1,000 ppmw and unit is operating above low load	1-hour average
	NO_x	75 ppmvdc @ 15% O_2	When operating above low load and when N is ≤150 ppm; Subpart GG limit	4-hour rolling average
	NO_x	75 ppmvdc @ 15% O_2 + 0.04 x N	When operating above low load and when N is >150 ppm; Subpart GG limit	4-hour rolling average
	CO	450 ppmvd@15% O_2	When operating 0 to 6 MW	1-hour average
	CO	420 ppmvd@15% O_2	When operating >6 to 12 MW	1-hour average
	CO	360 ppmvd @15% O_2	When operating >12 to 18 MW	1-hour average
	CO	159 ppmvd @15% O_2	When operating >18 to 24 MW	1-hour average
	CO	83 ppmvd @15% O_2	When operating >24 to Max MW	1-hour average
	CO	315.0 lbs/hour	When operating 0 to 6 MW	1-hour average
	CO	294. lbs/hour	When operating >6 to 12	1-hour average

			MW	
19, cont'd	CO	288.0 lbs/hour	When operating >12 to 18 MW	1-hour average
	CO	219.8 lbs/hour	When operating >18 to 24 MW	1-hour average
	CO	66.7 lbs/hour	When operating >24 to Max MW	1-hour average
	NO_x, CO, O_2	90% PMA		Calendar quarter
	Opacity	17%	Except for 3 (cherry-picked) minutes in any 30-minute rolling period, during which 40% is the limit. Do not report discarded minutes.	1-minute average
	Opacity	20%		1 minute
	Opacity	95% PMA		Calendar quarter
20	Fuel consumption	19,830,720 gallons/year		365-day rolling total
	Heat input	317.9 mmBtu/hour	Calculate by multiplying hourly fuel use by 140,000 Btu/gallon	1-hour average
	Fuel consumption	2,270 gallons/hour		1-hour average
	NO_x	103.0 lbs/hour	When operated w/o Unit 16	1-hour average
		229.4 lbs/hour	When operated w/Unit 16	1-hour average
	Operation	At ≤25% capacity	25% of total operating time	12-month rolling total
	Operation	At <15% capacity		Any 8-hour period
	Water injection	On at all times except SU/SD (load ≤25% capacity)		1-hour average
	NO_x	42 ppm @ 15% O_2 if nitrogen content of fuel oil is ≤150 ppm	When operating above low load (>25% capacity); Subpart GG limit	4-hour rolling average
	NO_x	Calculated limit = 42 ppm + [((N/10,000)-0.015) * 470.59] if nitrogen content of fuel oil is >150 ppm	When operating above low load (>25% capacity); Subpart GG limit	4-hour rolling average

20, cont'd	NO_x	20, cont'd	When fuel nitrogen content is >1,000 ppmw and unit is operating above low load	1-hour average
	NO_x	103 ppm @ 15% O_2	Subpart GG limit	4-hour rolling average
	Water-to-fuel ratio	≥ ratio established during initial testing	When operating at 25% load or higher	1-hour average
	SO_2	64.2 lbs/hour		1-hour average
	CO	450 ppmvdc @15% O_2	When operating 0 to 6 MW	1-hour average
	CO	420 ppmvdc @15% O_2	When operating >6 to 12 MW	1-hour average
	CO	360 ppmvdc @15% O_2	When operating >12 to 18 MW	1-hour average
	CO	159 ppmvdc @15% O_2	When operating >18 to 24 MW	1-hour average
	CO	83 ppmvdc @15% O_2	When operating >24 to Max MW	1-hour average
	CO	315.0 lbs/hour	When operating 0 to 6 MW	1-hour average
	CO	294. lbs/hour	When operating >6 to 12 MW	1-hour average
	CO	288.0 lbs/hour	When operating >12 to 18 MW	1-hour average
	CO	219.8 lbs/hour	When operating >18 to 24 MW	1-hour average
	CO	66.7 lbs/hour	When operating >24 to Max MW	1-hour average
	NO_x, CO, O_2	90% PMA		Calendar quarter
	Opacity	17%	Except for 3 (cherry-picked) minutes in any 30-minute rolling period, during which 40% is the limit. Do not report discarded minutes.	1-minute average
	Opacity	20%		1 minute
	Opacity	95% PMA		Calendar quarter

Table 3.b. Operational and Emission Limits For Randolph Harley Power Plant (St. Thomas)

Unit	Parameter	Limit	Notes	Interval
11	Fuel consumption	14,378 lbs/hour		3-hour average
	Fuel consumption – total fuel	43,000,000 gallons		365-day rolling total
	Opacity	20%	Except for 3 (cherry-picked) minutes in any 30-minute rolling period, during which 40% is the limit. Do not report discarded minutes.	1-minute average
15	Fuel consumption	17,410,000 gallons		365-day rolling total
	Fuel consumption	2,352 gallons/hour		3-hour average
	Heat input	310 mmBtu/hour		1-hour average
	NO_x	115 lbs/hour @ 15% O_2	When operated in SC mode	1-hour average
	NO_x	218 lbs/hour @ 15% O_2	1-hour, when operated in CC mode w/Unit 18	1-hour average
	NO_x	55 ppm @ 15% O_2 if nitrogen content of fuel oil is ≤150 ppm	When operating above low load (>25% capacity)	1-hour average
	NO_x	Calculated limit = 55 ppm + [((N/10,000)-0.015) * 470.59] if nitrogen content of fuel oil is >150 ppm	When operating above low load (>25% capacity)	1-hour average
	NO_x	NO_x ppm from above, used in equation to calculate NO_x lbs/hr limit. N sampling done daily; calculated limit in effect for that day.	When fuel nitrogen content is >1,000 ppmw and unit is operating above low load	1-hour average
	NO_x	115 ppm @ 15% O_2	Calculated Subpart GG limit	4-hour average
	Operation	At <25% capacity	17% of total operating time	12-month rolling total

15, cont'd	Water injection	On at all times except at reserve (load <25% capacity)		1-hour average
.	SO_2	66.8 lbs/hour		1-hour average
	SO_2	135.5 lbs/hour	When operated in CC mode w/Unit 15	1-hour average
	CO	13 lbs/hour	When operated in base load SC mode	1-hour average
	CO	405 lbs/hour	When operated in low-load SC mode	1-hour average
	CO	68 lbs/hour	When operated in base load CC mode w/Unit 15	1-hour average
	CO	729 lbs/hour	When operated in base load CC mode w/Unit 15	1-hour average
	CO	1,618 ppmvdc @15% O_2	When operating 0 to 5.6 MW	1-hour average
	CO	1,145 ppmvdc @15% O_2	When operating >5.6 to 11.3 MW	1-hour average
	CO	332 ppmvdc @15% O_2	When operating >11.3 to 17.1 MW	1-hour average
	CO	88 ppmvdc @15% O_2	When operating >17.1 to 22.8 MW	1-hour average
	CO	28 ppmvdc @15% O_2	When operating >22.8 to Max MW	1-hour average
	Opacity	17%	Except for 3 (cherry-picked) minutes in any 30-minute rolling period, during which 40% is the limit. Do not report discarded minutes.	1*minute average
18	Fuel consumption	18,223,600 gallons		365-day rolling total
	Fuel consumption	2,454 gallons/hour		3-hour average
	Heat input	323 mmBtu/hour	1-hour	1-hour average
	NO_x	103 lbs/hour @ 15% O_2	When operated in SC mode	1-hour average
	NO_x	218 lbs/hour @ 15% O_2	When operated in CC mode w/Unit 15	1-hour average
	NO_x	42 ppm @ 15% O_2 if nitrogen content of fuel oil is ≤150 ppm	When operating above low load (>25% capacity)	1-hour average

18, cont'd	NO_x	Calculated limit = 42 ppm + [((N/10,000)-0.015) * 470.59] if nitrogen content of fuel oil is >150 ppm	When operating above low load (>25% capacity)	1-hour average
	NO_x	NO_x ppm from above, used in equation to calculate NO_x lbs/hr limit. N sampling done daily; calculated limit in effect for that day.	When fuel nitrogen content is >1,000 ppmw and unit is operating above low load	1-hour average
	NO_x	103 ppm @ 15% O_2	Calculated Subpart GG limit	4-hour rolling average
	Operation	At <25% capacity	17% of total operating time	12-month rolling total
	Water injection	On at all times except at reserve (load <25% capacity)		1-hour average
	SO_2	68.7 lbs/hour	When operated in SC mode	1-hour average
	SO_2	135.5 lbs/hour	When operated in CC mode w/Unit 15	1-hour average
	CO	55 lbs/hour	When operated in base load SC mode	1-hour average
	CO	324 lbs/hour	When operated in low-load SC mode	1-hour average
	CO	68 lbs/hour	When operated in base load CC mode w/Unit 15	1-hour average
	CO	729 lbs/hour	When operated in base load CC mode w/Unit 15	1-hour average
	CO	1,369 ppmvdc @15% O_2	When operating 0 to 5.6 MW	1-hour average
	CO	855 ppmvdc @15% O_2	When operating >5.6 to 11.3 MW	1-hour average
	CO	234 ppmvdc @15% O_2	When operating >11.3 to 17.1 MW	1-hour average
	CO	94 ppmvdc @15% O_2	When operating >17.1 to 22.8 MW	1-hour average
	CO	73 ppmvdc @15% O_2	When operating >22.8 to Max MW	1-hour average

18, cont'd	Opacity	17%	Except for 3 (cherry-picked) minutes in any 30-minute rolling period, during which 40% is the limit. Do not report discarded minutes.	1-minute average
22	Fuel consumption	1,764 gallons/hour		3-hour average
	Heat input	247 mmBtu/hour		1-hour average
	NO_x	77 lbs/hour @ 15% O_2		1-hour average
	NO_x	75 ppm @ 15% O_2	Calculated Subpart GG limit	4-hour rolling average
	SO_2	52.1 lbs/hour		1-hour average
	CO	34 lbs/hour	Or concentration limit, whichever is more stringent	1-hour average
	CO	350 ppmvd@15% O_2	When operating 0 to 24% load	1-hour average
	CO	16 ppmvd @15% O_2	When operating 75 to 99% load	1-hour average
	CO	10 ppmvd @15% O_2	When operating at 100% load	1-hour average
	Operation	At <15% capacity		Any rolling 8-hour period
	Operation	At synchronous idle		Total of 6 hours/day
	Opacity	17%	Except for 3 (cherry-picked) minutes in any 30-minute rolling period, during which 40% is the limit. Do not report discarded minutes.	1-minute average
23	Fuel consumption	30,283,320 gallons		365-day rolling total
	Fuel consumption	3,457 gallons/hour		3-hour average
	Heat input	484 mmBtu/hour		1-hour average
	NO_x	135 lbs/hour @ 15% O_2		1-hour average
	NO_x	90 ppm @ 15% O_2	Calculated Subpart GG limit	4-hour rolling avg
	Unit	May operate at low		1-hour average

	operation	load (<25% capacity) only during SU/SD		
23, cont'd	SO_2	71.4 lbs/hour		1-hour average
	CO	81 lbs/hour	Or concentration limit, whichever is more stringent	1-hour average
	CO	174 ppmvd@15% O_2	When operating 0 to 4.7 MW	1-hour average
	CO	No limit	When operating 4.7 to 14.6 MW	1-hour average
	CO	18 ppmvd @15% O_2	When operating >14.6 to 19.2 MW	1-hour average
	CO	14 ppmvd @15% O_2	When operating >19.2 to max MW	1-hour average
	Opacity	17%	Except for 3 (cherry-picked) minutes in any 30-minute rolling period, during which 40% is the limit. Do not report discarded minutes.	1-minute average

Notes:

[1] When exhaust from Units 15 or 18 is routed through the HRSG, use the higher limit between the two units.

Determining Unit Operating Status

A digital input from the DCS will be used to define the operational status of each unit. The condition that triggers this input is fuel flow > 1.0 lb/minute For opacity monitoring, the "unit on" status is triggered by fuel flow > 1.0 lb/minute.

Data Averaging

The tables below detail the types of data averages constructed by the PLC and DAHS for each parameter using the CEMS analyzer readings and DCS signals. Note that 15-minute block averages will not be provided; instead, a 1-hour "building block" average will be constructed for purposes of display to plant operators and instrument technicians. This average will update every five minutes, and be available for viewing on that frequency, and will reflect the hourly average constructed from the valid minutes that have been recorded

to that point in time. No hourly validation will be performed on this average, which is for system operation and exceedance prediction purposes only.

Table 7.a. Data Averaging for Estate Richmond Power Plant (St. Croix)

Parameter and Units of Measure	Standard P60 1-Hour Block	Calendar Quarter	4-Hour Roll	365-day Calendar Day Roll	12-Month Rolling Total
CO ppm corrected	✓				
CO lbs/hour	✓				
CO PMA		✓			
CO_2 percent	✓				
Fuel flow, oil gals/hour	✓			✓	
Heat input, mmBtu/hour	✓				
NO_x PMA		✓			
NO_x ppm	✓				
NO_x ppm corrected	✓		✓		
NO_x lbs/mmBtu	✓				
NO_x lbs/hour	✓				
NO_x tons/year					✓
Opacity	✓				
O_2 %	✓				
O_2 PMA		✓			
SO_2 lbs/hour	✓				
Unit operation, % capacity	✓				✓
Water injection,	✓				
Water:fuel ratio	✓				

Table 7.b. Data Averaging for Randolph Harley Power Plant (St. Thomas)

The parameters and averaging intervals required for this facility are identical to those detailed above, with the addition of the following:

Parameter and Units of Measure	*15-Minute Block*	Standard P60 1-Hour Block	Total of 6 Hrs/Day	3-Hour Roll	Only During SU/SD
Fuel flow, oil gals/hour	✓	✓		✓	
Fuel flow, total gals/hour	✓	✓		✓	
Unit operation at synchronous idle (Unit 22 only)	✓	✓	✓		
Unit operation at low load (<25% capacity)	✓	✓			✓

Data Validation and Averaging

The following data validation rules will be used by the DAS to generate averages. Only valid readings will be used to build an average.

The source must be operating for any average to be considered valid.

- 1-minute average. All parameters will be constructed from this fundamental average. For all parameters, including opacity, it will consist of 60 1-second averages. If any one of these one-second readings is invalid, then the resulting 1-minute average will be marked invalid.

- 1-hour block average (Standard Part 60). A 1-hour block average will include all the valid 1-minute averages for an hour starting with minute 00 through minute 59. An operating hour is defined as any hour where the source combusts fuel for at least one minute. The hourly average will be constructed from all valid minutes, equally weighted. A valid 1-hour average must consist of at least one valid 1-minute average in each operating 15-minute quadrant in any operating hour. In any full operating hour where a calibration is performed or preventive maintenance occurs. then only

one valid 1-minute average in two of the four operating 15-minute quadrants of the hour is needed, separated by a minimum of 15 minutes. In any partial operating hour where a calibration is performed or preventive maintenance occurs, one valid data point must be recorded in each quadrant in which the unit operates. In an hour in which a calibration failure occurred, the hour will be valid only if two operating quadrants following a successful calibration check contain valid data. Does this scheme include opacity?

- 1-hour block average (Process parameters). One-hour block averages for process parameters will be an arithmetic average all of the 1-minute averages in an hour regardless of the operating status. Common process parameters that this applies to are: MW and Steam Flow. There is no data validation on process signals.

- 1-hour block total (Process parameters). This total will sum all of the 1-minute averages in an hour that correspond to the operating minutes. Common process parameters that this applies to are: MW and Steam Flow. There is no data validation on process signals.

- Fuel factor. A date/time-stamped operator-entered constant will be provided for the fuel factor for each fuel, which will be used in any calculations as necessary.

- Daily average. This average will consist of all the valid 1-hour averages that occur for a calendar day (hours: 00 – 23). The 24-hour averages will be updated once a day. All 24-hour averages will be calculated as an arithmetic mean. At least one valid average must exist to compute the average. The data validity for daily averages is provided for information purposes only, i.e., it is not used to generate any multi-day average that is used for compliance determination.

- Quarterly total. This total will be the mathematical sum of all valid 1-hour averages that were recorded for the calendar quarter. At least one valid average must exist to compute the total.

- 3-hour rolling average (Permit). This average will consist of all valid 1-hour averages that were recorded for the current hour plus the previous 2 hours. If a non-operating hour occurs during a 3-hour period, the average will re-set, i.e., a new 3-hour average begins with the first hour of unit operation. At least one valid hour within a 3-hour contiguous operating period must be valid to compute the average.

- 4-hour rolling average (Part 60, Subpart GG). This average will consist of all valid 1-hour averages that were recorded for the current hour plus the previous 3 hours. If a non-operating hour occurs during a 4-hour period, the average will re-set, i.e., a new 4-hour average begins with the first hour of unit operation. At least one valid hour within a 4-hour contiguous operating period must be valid to compute the average.

- 365 calendar day rolling average (Permit). The average will consist of all valid 1-hour averages that occurred for the previous 365 calendar days. The 365-day rolling average will be updated at the close of each day. The average will be calculated as an arithmetic mean. At least one valid hour within the 365-day period must be valid to compute the average. Only one operating minute is required to have an operating day.

- 12-month rolling totals. This total will include all valid 1-hour averages that occurred for the current month and the eleven previous months. The 12-month total will be updated at the close of each month. The average will be calculated as an arithmetic mean. At least one valid hour within the 12-month period must be valid to compute the average. All 1-hour rate averages will be converted to a total by multiplying the rate by the operating time. All Part 60- or permit-related totals for this project will be based on Part 60 data. Startup and Shutdown hours will be included; invalid hourly averages will not be included.

APPENDIX C.3

QA

Regulations Training Course

St. Thomas
December 10-11, 2013

Marsha Layman

QA

Course Objectives

- Understand the regulations numbering system
- Understand how laws and regulations are developed
- Terms and acronyms
- Get comfortable finding various sections in the rules
- How to recognize "gray areas"
- Sources of help

2

QA

Course Objectives

- Discuss specific regulations of interest:
  - New Source Performance Standards (Part 60)
  - Federal Greenhouse Gas Mandatory Reporting Rule (Part 98)

3

Getting Oriented

Getting oriented in the world of regulations

	Law (Statute)	*Regulation (Rule)*
Written and passed by	Elected body (Congress, State Legislature)	Implementing agency (EPA, DOT, etc.)
Contains	Broad language at the program level	Specific requirements for the regulated community
Measurable criteria	Some	Much

4

Getting Oriented

Some language a from a law - the Clean Air Act Amendments of 1990:

THE CLEAN AIR ACT

TITLE I - AIR POLLUTION PREVENTION AND CONTROL

Part A - Air Quality and Emission Limitations

FINDINGS AND PURPOSES Sec. 101. (a) The Congress finds - (1) that the predominant part of the Nation's population is located in its rapidly expanding metropolitan and other urban areas, which generally cross the boundary lines of local jurisdictions and often extend into two or more States;

5

Getting Oriented

SEC. 401. FINDINGS AND PURPOSES.

(a) Findings.- The Congress finds that- (1) the presence of acidic compounds and their precursors in the atmosphere and in deposition from the atmosphere represents a threat to natural resources, ecosystems, materials, visibility, and public health;

6

QA Getting Oriented

2) the principal sources of the acidic compounds and their precursors in the atmosphere are emissions of sulfur and nitrogen oxides from the combustion of fossil fuels;

(3) the problem of acid deposition is of national and international significance;

7

QA Getting Oriented

(4) strategies and technologies for the control of precursors to acid deposition exist now that are economically feasible, and improved methods are expected to become increasingly available over the next decade;

(5) current and future generations of Americans will be adversely affected by delaying measures to remedy the problem;

8

QA Getting Oriented

(6) reduction of total atmospheric loading of sulfur dioxide and nitrogen oxides will enhance protection of the public health and welfare and the environment; and

(7) control measures to reduce precursor emissions from steam-electric generating units should be initiated without delay.

9

Getting Oriented

Some language from an NSPS regulation:

(a) No owner or operator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere from any fluid catalytic cracking unit catalyst regenerator any gases that contain carbon monoxide (CO) in excess of 500 ppm by volume (dry basis).

10

Getting Oriented

Code of Federal Regulations (CFR):

- Annual compilation of all new rules and changed rules for all agencies
- Published by the Government Printing Office
- Grouped by "Titles"
- Title 40 is for EPA regulations

11

Getting Oriented

Using the handout, find the title that pertains to regulations for "Banks and Banking"?

Which of our favorite agencies implements regulations under Title 26?

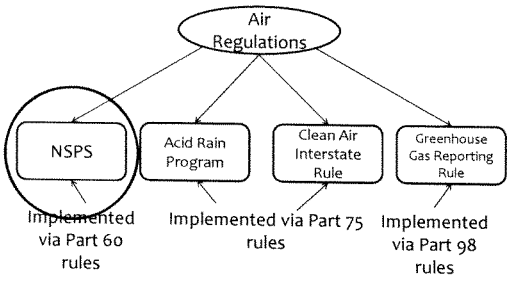
12

Getting Oriented

Resources

- E-CFRS http://www.gpoaccess.gov/
- EPA Field Audit Manual http://www.epa.gov/airmarkets/emissions/audit-manual.html

13



14

New Source Performance Standards Program

40 CFR Part 60

15

Introduction to NSPS

Premise of program is end-of-pipe (stack) emissions limits that are based on:

- Industry type
- Vintage of unit
- Fuel combusted
- Emission controls used

16

Introduction to NSPS

Philosophy of the NSPS program:

- Show compliance with published emission limits
- That, in turn, will demonstrate that the source is operating properly and is maintaining its process and control equipment properly

17

Introduction to NSPS

NSPS Origination

- EPA established in 1970
- New Source Performance Standards program created in 1971
- New sources now regulated by EPA
- Not a retrofit program!
- Sources now have a Federal, technology-based performance standard to meet

18

Introduction to NSPS

Basic tenants of NSPS program:

- State Implementation Plans (SIPs)
- Established "criteria pollutants" to indicate ambient air quality for:

SO_2	NO_x
PM	CO
Ozone	Lead

- Numeric standards and intervals assigned to each criteria pollutant

19

Different hair standings

National Ambient Air Quality Standards

Pollutant	Primary Standards Level	Primary Standards Averaging Time	Secondary Standards Level	Secondary Standards Averaging Time
Carbon Monoxide	9 ppm (10 mg/m³)	8-hour [1]	None	
	35 ppm (40 mg/m³)	1-hour [1]		
Lead	0.15 µg/m³ [2]	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m³	Quarterly Average	Same as Primary	
Nitrogen Dioxide	0.053 ppm (100 µg/m³)	Annual (Arithmetic Mean)	Same as Primary	
Particulate Matter (PM_{10})	150 µg/m³	24-hour [3]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m³	Annual [4] (Arithmetic Mean)	Same as Primary	
	35 µg/m³	24-hour [5]	Same as Primary	
Ozone	0.075 ppm (2006 std)	8-hour [6]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [7]	Same as Primary	
	0.12 ppm	1-hour [1]	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm (1300 µg/m³)	3-hour [1]
	0.14 ppm	24-hour [1]		

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Introduction to NSPS

- Geographic areas determined to be either "In attainment" or "Non-attainment"
- If "Non-attainment," how severe is the degree:
  - Marginal,
  - Moderate,
  - Serious,
  - Severe, or
  - Extreme

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QA

Nonattainment Map for Ground-level Ozone and Particulate Matter (2004)

22

QA Introduction to NSPS

The New Source Performance Standards program is implemented using two tools:

1. Facility air operating permits that are issued by states
2. Federal emission standards and emissions monitoring requirements for each industry category

The federal emission standards and monitoring tool is codified in 40 CFR 60

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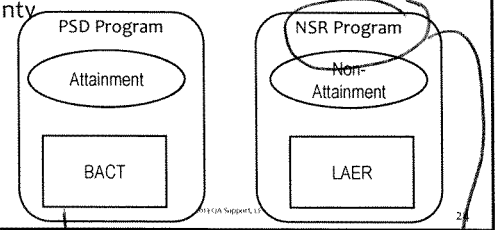
QA Introduction to NSPS

The operating permit tool: When a new source is constructed, the types of emission controls required via the operating permit are determined by the attainment status of that county



24

Lowest available emission rate (LAER)
- problems how to control better

prevention

limits will be more strict

Introduction to NSPS

What is BACT?

- Limit based on the maximum degree of control that can be achieved
- Case-by-case decision
- Considers energy, environmental, & economic impact
- Can be:
  - Add-on controls,
  - Modification of the production processes or methods
  - Fuel cleaning or treatment,
  - Innovative fuel combustion techniques, or
  - An operational standard if an emissions standard is infeasible

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Introduction to NSPS

What is LAER?

- The most stringent emission limitation derived from either of the following:
  - The most stringent emission limitation contained in the implementation plan of any State for such class or category of source; or
  - The most stringent emission limitation achieved in practice by such class or category of source

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Introduction to NSPS

Purpose of the NSPS program:

- Show compliance with published emission limits
- That, in turn, will demonstrate that the source is operating properly and is maintaining its process and control equipment properly

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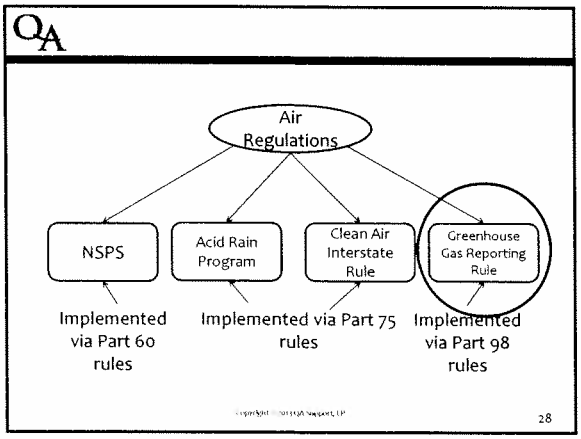

Doesn't apply to VIWAPA

Introduction to GHG Programs

First program is Regional Greenhouse Gas Initiative (RGGI):

- Began in 2003 with discussions in 11 states from Maine to Maryland
- Model rule in 2006 for 8 participating states
- January 1, 2009 – sources began monitoring and reporting
- January 1, 2010 – trading began

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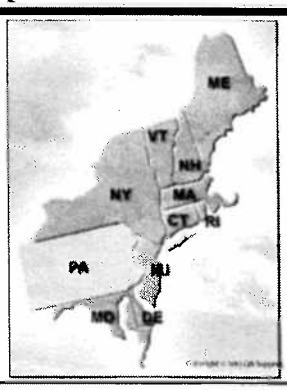
Introduction to GHG Programs



The RGGI states; Pennsylvania is an observer

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Introduction to GHG Programs

Greenhouse Gas Mandatory Reporting Rule (GHG MRR):

- Published late 2009
- Codified in 40 CFR Part 98
- Affects all EGUs in the continental US

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Introduction to GHG Programs

Rule requires "reporting of greenhouse gas emissions from all sectors of the economy," including:

- Direct emitters
- Fossil fuel suppliers

No emission limits or trading at this time – just reporting

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Introduction to GHG Programs

These pollutants may be required to be reported by the industry-specific subpart:

- CO_2
- N_2O
- Methane CH_4
- Sulfur hexafluoride (SF_6) – not for EGUs
- Hydrofluorocarbons (HFCs) – not for EGUs
- Perfluorochemicals (PFCs) – not for EGUs

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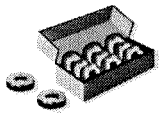
QA

End of module



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QA

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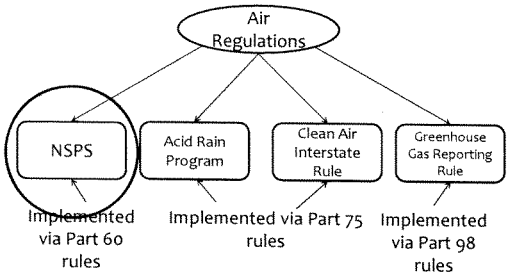

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Lead	0.15 µg/m³ [2]	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m³	Quarterly Average	Same as Primary	
Nitrogen Dioxide	0.053 ppm (100 µg/m³)	Annual (Arithmetic Mean)	Same as Primary	
Particulate Matter (PM_{10})	150 µg/m³	24-hour [3]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m³	Annual [4] (Arithmetic Mean)	Same as Primary	
	35 µg/m³	24-hour [5]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [6]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [7]	Same as Primary	
	0.12 ppm	1-hour [8]	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm (1300 µg/m³)	3-hour [1]
	0.14 ppm	24-hour [1]		

20

Introduction to NSPS

- Geographic areas determined to be either "In attainment" or "Non-attainment"
- If "Non-attainment," how severe is the degree:
  - Marginal,
  - Moderate,
  - Serious,
  - Severe, or
  - Extreme

21

QA

Nonattainment Map for Ground-level Ozone and Particulate Matter (2004)

22

QA

Introduction to NSPS

The New Source Performance Standards program is implemented using two tools:

1. Facility air operating permits that are issued by states
2. Federal emission standards and emissions monitoring requirements for each industry category

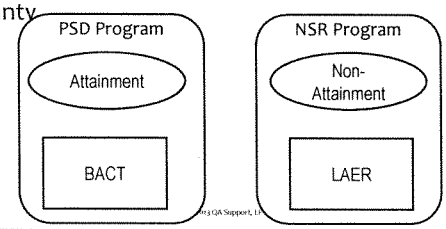
The federal emission standards and monitoring tool is codified in 40 CFR 60

23

QA

Introduction to NSPS

The operating permit tool: When a new source is constructed, the types of emission controls required via the operating permit are determined by the attainment status of that county.



24

Introduction to NSPS

What is BACT?

- Limit based on the maximum degree of control that can be achieved
- Case-by-case decision
- Considers energy, environmental, & economic impact
- Can be:
  - Add-on controls,
  - Modification of the production processes or methods
  - Fuel cleaning or treatment,
  - Innovative fuel combustion techniques, or
  - An operational standard if an emissions standard is infeasible

25

Introduction to NSPS

What is LAER?

- The most stringent emission limitation derived from either of the following:
  - The most stringent emission limitation contained in the implementation plan of any State for such class or category of source; or
  - The most stringent emission limitation achieved in practice by such class or category of source

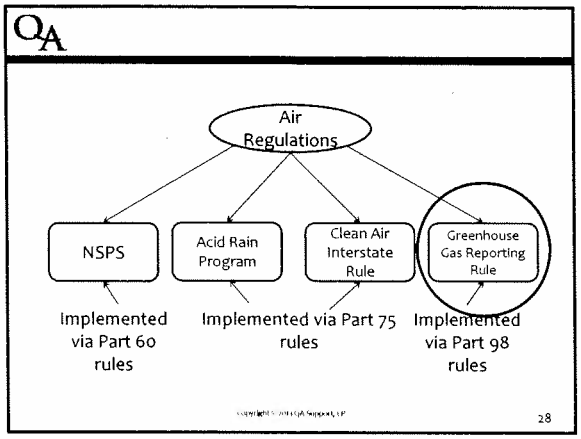
26

Introduction to NSPS

Purpose of the NSPS program:

- Show compliance with published emission limits
- That, in turn, will demonstrate that the source is operating properly and is maintaining its process and control equipment properly

27



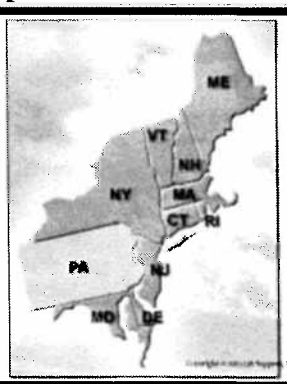
Introduction to GHG Programs

First program is Regional Greenhouse Gas Initiative (RGGI):

- Began in 2003 with discussions in 11 states from Maine to Maryland
- Model rule in 2006 for 8 participating states
- January 1, 2009 – sources began monitoring and reporting
- January 1, 2010 – trading began

29

Introduction to GHG Programs



The RGGI states; Pennsylvania is an observer

30

Introduction to GHG Programs

Greenhouse Gas Mandatory Reporting Rule (GHG MRR):

- Published late 2009
- Codified in 40 CFR Part 98
- Affects all EGUs in the continental US

31

Introduction to GHG Programs

Rule requires "reporting of greenhouse gas emissions from all sectors of the economy," including:

- Direct emitters
- Fossil fuel suppliers

No emission limits or trading at this time – just reporting

32

Introduction to GHG Programs

These pollutants may be required to be reported by the industry-specific subpart:

- CO_2
- N_2O
- Methane CH_4
- Sulfur hexafluoride (SF_6) – not for EGUs
- Hydrofluorocarbons (HFCs) – not for EGUs
- Perfluorochemicals (PFCs) – not for EGUs

33

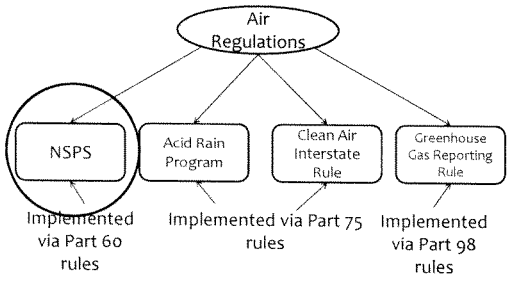
QA

End of module

34

SPEG WAPA logo
c m|sgmcn @qasupport.com
12/1/13

QA



1

QA

New Source Performance Standards Program

40 CFR 60

2

QA

Part 60 Objectives

- Understand the basic requirements of the NSPS program
- Become familiar with the orientation of the sections in the rule, and be able to locate important sections
- Learn the specific requirements for data validity and QA/QC testing
- Explore the math functions involved in calculating emissions

3

Part 60 – General Rules

Your Part 60 rules book is divided (via colored pages) into these sections.
Locate them all:

Subpart A	Appendix A
Subpart GG	Appendix B
Subpart KKKK	Appendix F

4

Part 60 – General Rules

Within each divided section, the rules are numbered, with each "section number" signified by a section symbol: §.

Find § 60.13 in Subpart A

5

Part 60 – General Rules

The sections are further broken down into subparagraphs, using the outline form:

§ xx.xx
(a)
(1)
(i)
(A)

6

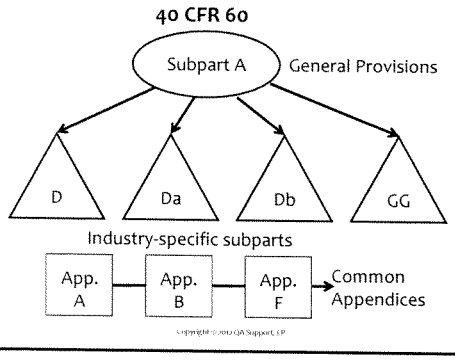
How to be a lawyer

Part 60 – General Rules

Find § 60.7 (e)(1)(iii) in Subpart A

7

Part 60 – General Rules



8

GG - relatively modern combustion gases (VIWAPA)

Part 60 – General Rules

Philosophy of the NSPS program:

- Show compliance with published emission limits
- That, in turn, will demonstrate that the source is operating properly and is maintaining its process and control equipment properly

9

Part 60 – General Rules

Subpart A applies to:

- Any source that is constructed after the date of the applicable subpart
- Any source that is modified after the date of the applicable subpart (§60.1(a))

10

Part 60 – General Rules

Subpart A contains:

- Definitions
- Notification requirements
- Daily calibration error test requirements
- Reporting requirements

11

Part 60 – General Rules

Section 60.7(b) requires certain records to be kept.

What records must be kept?

12

Part 60 – General Rules

§ 60.7(b) requires records to be kept of:

- Occurrence and duration of any unit startup, shutdown, or malfunction
- Occurrence and duration of any malfunction of the pollution control equipment
- Periods that the CEMS is inoperative

13

Part 60 – General Rules

How is compliance determined in NSPS?

- Unless specified in another subpart, compliance for everything but opacity is determined by stack tests (§60.11(a))
- Compliance with opacity limits is via Method 9, but can be demonstrated with COMS (§60.11(b))

14

Part 60 – General Rules

Subpart A, §60.13(a) tells us to follow what two parts of the regulations for all CEM systems installed under the industry-specific subparts?

15

Part 60 – General Rules

Certification testing and ongoing QA:

- Must undergo performance testing in accordance with the Performance Specification for that instrument
- Must comply with appendix F if you're using CEMS/COMS to show compliance with a limit on a continuous basis

16

Initial Certification

17

Part 60 – Initial Certification

What tests are required for initial certification?

Tests are specified in the Performance Specifications for each analyzer type, in Appendix B:

- PS-1 for opacity
- PS-2 for SO_2/NOx
- PS-3 for CO_2/O_2
- PS-4 for CO monitors w/span >1000 ppm
- PS-4A for CO span <200 ppm
- PS-4B for CO dual range (200/3000)

18

In §60 law on certification

Requirements for all monitoring equipments

Part 60 – Initial Certification

Find the Performance Specification in Appendix B for SO_2 and NO_x monitors

Then find the two certification tests that are required for initial certification in §§8.3 and 8.4

19

Part 60 – Initial Certification

§8.3 of PS-2 in Appendix B describes the procedure for a 7-day calibration error drift test

§8.4 describes the RATA procedure

20

7-Day Calibration Error Test

21

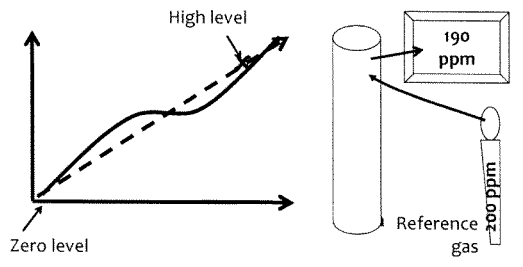
Part 60 – 7-Day Calibration Drift Test

Purpose is to show that the analyzer doesn't drift excessively over a 7-day period

- Required for all analyzers (including stack flow)
- Challenge the instrument once each day with two references and compute the amount of error

22

Part 60 – 7-Day Calibration Drift Test



23

Cal tests have to test the zero & high level

Part 60 – 7-Day Calibration Drift Test

§8.3 of PS-2 in Appendix B describes the procedure for a 7-day calibration error drift test

Locate this section, then find answers to the questions on the following slide

24

Part 60 – 7-Day Calibration Drift Test

Appendix B, PS-2, §8.3

- Must the unit be operating for this test? – Yes
- How frequently is the test performed? – ~~once a~~ 24 hour drift
- What if the unit doesn't operate 7 cons. days? → unit operating days
- How are instrument adjustments handled?
- How many points are tested? – 2
- What equation is used to compute the error, according to Table 2-2?

25

Part 60 – 7-Day Calibration Drift Test

What are the performance specifications for this test, according to §13.1?

26

Cal Error = $\frac{\text{reference} - \text{analyzer}}{\text{span}} \times 100\%$

can only drift 2.5% from the span value

Part 60 – 7-Day Calibration Drift Test

- §13.1 says the CEMS must not drift more than 2.5% of the span value for each of 6 out of 7 test days

What are the PS for other instruments:

- Diluent?
- CO?

27

Part 60 – 7-Day Calibration Drift Test

Performance specifications for O_2/CO_2 are:

- 7-day drift test: 0.5% of O_2/CO_2 for each level (zero, upscale) each day

From PS-3

Performance tests are due < 60 days after max production rate and < 180 days after initial startup

28

Cycle Time Test

29

Part 60 – Cycle Time Test

- Purpose is to ensure that the analyzer will respond in a timely manner to changes in stack gas concentration taking into consideration sample transport
- Run for all pollutant and diluent analyzers
- Performed on both ranges of a dual-range system – each range's cycle time is independent

30

Part 60 – Cycle Time Test

PS-4A (for CO analyzers) §8.3 describes the cycle time test procedure

Locate this section, then find answers to the questions on the following slide

31

Part 60 – Cycle Time Test

PS-4A, §8.3

What reference gas is introduced first? – zero gas

Second?

What is the next step? – upscale gas

How many sets of injections are made?

How is the system response time determined?

32

how do you know if it passed ⇒ APP B PS-4 13.1

Opacity Certification

33

Part 60 – Opacity Certification

For opacity systems: Must now get a certificate of conformance from mfg showing that ASTM D 6217-98 is met for systems that are:

- Installed or replaced/relocated/or substantially refurbished after 2/6/01
- Or installed before then but you're required by some other action to comply with new PS-1

34

Part 60 – Opacity Certification

In-field tests to perform for opacity monitors:

- Optical alignment assessment
- Calibration error check
- System response time check
- Averaging period calc & recording check
- 7-day calibration error check

35

Recertification Requirements

36

Part 60 – Recertification

Recertification requirements?

- Not addressed in P60
- Review state agency guidance
- If not available, contact agency
- At a minimum, follow the Part 75 recertification and diagnostic test policy

37

Part 60 – Recertification

When is recertification required?

- Detailed in §75.20(b)
- "Whenever … operator makes a replacement, modification or change in a certified CEMS that may significantly affect the ability of the system to accurately measure or record …"

38

Part 60 – Recertification

- "Whenever … operator makes a replacement, modification or change

  to the flue gas handling system or unit operation

  that may significantly change the flow or concentration profile … the operator shall recertify the monitoring system"

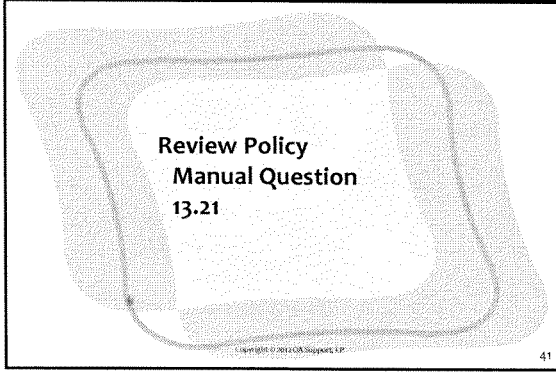
39

Part 60 – Recertification

- EPA created Policy Manual Question 13.21, which describes various events and the appropriate recertification or diagnostic tests to be performed on each

40

Part 60 – Recertification

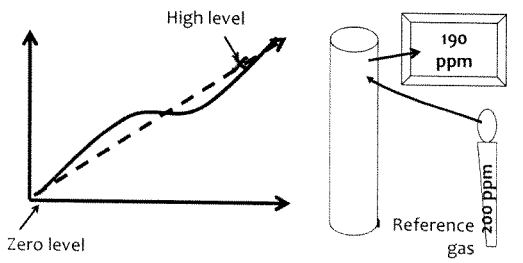


41

Daily Calibration Error Test

42

Part 60 – Calibration Error Test



43

Inject gas at zero scale
& high level scale (DAILY)

Part 60 – Daily Calibration Error Test

Section 60.13(d)(1) discusses the daily calibration error check

Locate this section, then find answers to the questions on the following slide

44

Part 60 – Daily Calibration Error Test

Section 60.13(d)(1)

1. What levels are checked each day?
2. When must the instrument be adjusted?
3. What is that amount?

45

CGA

Part 60 – Daily Calibration Error Test

Daily QA for each CEMS:

- Conduct calibration drift tests daily
  - Zero (0 – 20% of span)
  - Span (50 – 100% of span)
- CEMS must be adjusted if drift is more than 2 times the Performance Specification (PS)
- Each CEMS performance specification is found in Part 60 Appendix B

§60.13(d)(1)

46

Part 60 – Daily Calibration Error Test

Find the Performance Specification in Appendix B for SO_2 and NO_x monitors

Then find the performance specification for daily cal checks in §13.1

47

Part 60 – Daily Calibration Error Test

Section 13.1 says the PS is 2.5% of span

So, inserting that back into the Subpart A rule of:

"CEMS must be adjusted if drift is more than 2 times the PS"

we know that CEMS must be adjusted when drift >5.0% (2 x 2.5)

48

Part 60 – Daily Calibration Error Test

When is CEMS OOC?

Locate Appendix F §4.3, which contains the QA/QC Procedures

49

Part 60 – Daily Calibration Error Test

Section 4.3 says the CEMS is OOC if either the zero or high cal >2x the PS for five consecutive days

Or, if either the zero or high cal >4x the PS for any single day

2x the PS for 5 days	*4x the PS for one day*
2x 2.5% for 5 days	4x 2.5% for 1 day
5.0% for 5 days	10.0% for 1 day

50

Part 60 – Daily Calibration Error Test

What data gets invalidated because of a failed calibration?

Find Appendix F, §4.3.1

51

Part 60 – Daily Calibration Error Test

Appendix F, §4.3.1 says that the OOC period starts on:

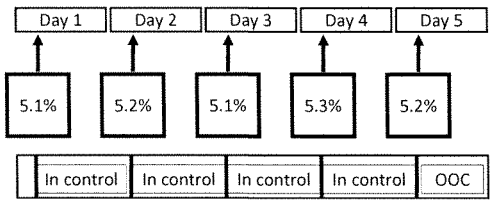
- The fifth daily cal has exceeded the drift by 2X or
- The daily cal preceding the cal that exceeds 4X the limit

The period ends upon completion of a good cal

52

Part 60 – Daily Calibration Error Test

OOC and data validation example – 5 day drift

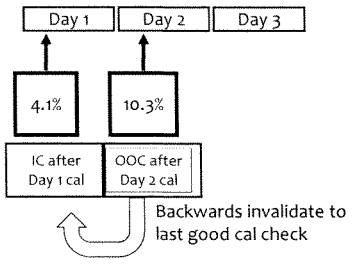


53

must adjust the calibration if it is more than 2x the ~~mean~~ limit. On the 5th day OOC

Part 60 – Daily Calibration Error Test

OOC and data validation example – 1 day drift



54

Part 60 – Daily Calibration Error Test

Other calibration check test "good practices":

- Be sure to keep cylinder certifications!
- An expired cylinder may not be used
- A cylinder may not be used if its pressure is <150 psig

don't get good mixing of the gases

55

Part 60 – Daily Calibration Error Test

Section 60.13(d)(1) also discusses the COMS check that must be done daily

What is this test, and how is it performed?

56

Part 60 – Daily Calibration Error Test

For opacity analyzers, you are required to clean the optical surfaces

when the cumulative automatic zero compensation exceeds 4% opacity –

No OOC specification!!!

57

QA

Data Collection and Validation

58

QA **Part 60 – Data Collection & Validation**

Subpart A §60.13(e) tells us when emissions must be monitored

What is that requirement?

59

QA **Part 60 – Data Collection & Validation**

CEMS/COMS must be in continuous operation except for, breakdowns, repairs, calibration checks and adjustments (§60.13(e))

60

QA Part 60 – Data Collection & Validation

What constitutes "operation" for Part 60?

- Most states use the status of "combusting fuel" for gaseous emissions
- For opacity, most states use the state of "fans being on," as you can have opacity emissions when fuel is not combusted
- State gets to decide
- Clarify, if you can, in your permit

61

QA Part 60 – Data Collection & Validation

Subpart A §60.13(e) tells us when how many samples must be taken, analyzed, and recorded

What is that requirement for opacity?

For everything else?

62

QA Part 60 – Data Collection & Validation

Data capture rules (§60.13(e)(1))

	CEMS	COMS
Sampling & analysis	1 cycle every 15 minutes	1 cycle every 10 seconds
Recording	1 cycle every 15 minutes	1 cycle every 6 minutes

63

Part 60 – Data Collection & Validation

Subpart A §60.13(h)(1) tells us what averaging intervals are to be constructed for the data that is collected ("data reduction")

What is that requirement for opacity?

For everything else?

64

Part 60 – Data Collection & Validation

- Data reduction rules (§60.13(h))

CEMS	*COMS*
1-hour average	6-minute average

- Must use all valid data points collected

65

Part 60 – Data Collection & Validation

Subpart A §60.13(h)(2) tells us how to build a one-hour average

Locate this section, then find answers to the questions on the following slide

66

QA Part 60 – Data Collection & Validation

Subpart A §60.13(h)(2)

1. How many data points are needed for a full operating hour?
2. How many data points are needed for partial operating hours?
3. How many valid quadrants are needed for an hour in which maintenance or QA activities are performed?
4. What spacing is needed between the data points?

67

QA Part 60 – Data Collection & Validation

For full operating hours (60 minutes of unit operation):

- Must collect one valid data point in each of 4 quadrants

68

QA Part 60 – Data Collection & Validation

For partial operating hours:

- Collect 1 data point in each quadrant in which the unit operates (new)

69

QA Part 60 – Data Collection & Validation

For hours containing maintenance activities or calibration checks:

- Must have one valid data point in each of 2 quadrants if the unit operated in 2 or more quadrants
- Must have one valid data point if the unit operated in only 1 quadrant

New!

70

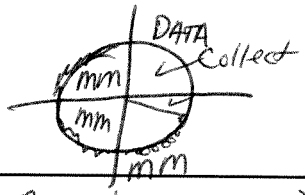
mm = maintenance mode

QA Part 60 – Data Collection & Validation

If I have a maintenance task that I think will occupy <90 minutes,

how can I use knowledge of the data validity rules so that I have no missing data?

71



As long as data is collected for (2) quadrants in the hour the hour is valid

QA Part 60 – Data Collection & Validation

What special requirement exists in 60.13(h)(2)(iv)?

72

Have to have 2 good quadrants after a recalibration

Part 60 – Data Collection & Validation

If a cal check fails, that hour is invalid unless a replacement cal check is completed within that same hour, and one data point in each of two quadrants following the replacement cal is collected

73

Part 60 – Data Collection & Validation

Data from a CEMS becomes invalid if:

- Equipment not certified or recertified by the required deadline
- Not enough valid data points or quadrants
- Any required QA test was failed or missed:
  - Daily cal check
  - Quarterly linearity test
  - RATA

74

Part 60 – Data Collection & Validation

If any of these results in an invalid hour, what do we do in Part 60?

75

QA

Reporting and Recordkeeping

76

QA **Part 60 – Recordkeeping & Reporting**

3 types of reports:

1. Excess emissions and performance summary report (Subpart A)
2. Excess emissions and monitoring systems performance report (Subpart A)
3. Data assessment report (App. F)

77

QA **Part 60 – Recordkeeping & Reporting**

The summary report is depicted in §60.7(d), Figure 1

- Summarizes excess emissions events and monitor downtime events that occurred during the reporting period
- Events are categorized
- Total duration of events (excess emissions and monitor downtime) are expressed as a % of the unit operating time

78

QA Part 60 – Recordkeeping & Reporting

Percent Monitor Availability (PMA) =

$$\frac{Number\ of\ Valid\ CEMS\ Hours}{Unit\ Operating\ Time}\ x\ 100$$

What PMA does EPA want to see?

79

QA Part 60 – Recordkeeping & Reporting

100%! Full CEMS operation during unit operation.

Generally, states take no enforcement action if PMA>95%, but this is tightening; also citizen suits

80

QA Part 60 – Recordkeeping & Reporting

Section 60.7(c) details the contents of the excess emission report:

- Submit semi-annually unless subpart says more frequently
- Postmarked 30th day after period closes
- Magnitude of excess emissions; date/time of each
- Specific identification of EEs that occur during SSM

81

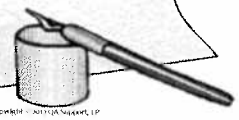
QA Part 60 – Recordkeeping & Reporting

- Submit the summary report if the total duration of excess emissions is:
  - < 1% of the total operating time and
  - CEMS downtime is < 5%

82

QA Part 60 – Recordkeeping & Reporting

Using the sample Excess Emissions Summary Report in your handouts, answer the questions in the exercise



83

QA Part 60 – Recordkeeping & Reporting

Data Assessment Report

- Described in Appendix F §7; required by Da and Db, although many states also require them via permit or rule
- All RATA & CGA test results and details
- Summary of all corrective actions taken when CEMS was OOC

84

Part 60 – Recordkeeping & Reporting

Section 60.7(b) requires certain records to be kept.

What records must be kept?

85

Part 60 – Recordkeeping & Reporting

§ 60.7(b) requires records to be kept of:

- Occurrence and duration of any unit startup, shutdown, or malfunction
- Occurrence and duration of any malfunction of the pollution control equipment
- Periods that the CEMS is inoperative

86

Part 60 – Recordkeeping & Reporting

Section 60.7(f) requires certain additional records to be kept.

What records must be kept?

87

5 years to hold ~~Testing~~ records

Part 60 – Recordkeeping & Reporting

§ 60.7(f) requires records to be kept of:

- All CEMS measurements
- All performance testing measurements
- All CEMS calibration checks
- All adjustments and maintenance performed
- All other info required by a subpart
- Keep for 2 years
- Additional details for CEMS in (f)(1)

88

Calculating Emissions

89

Part 60 – Calculating Emissions

Monitoring requirements (§60.13):

- Subparagraph (f) requires you to install monitors "such that representative measurements of emissions or process parameters ... are obtained"
- Must comply with performance specifications under appendix B (including siting requirements)...

90

Part 60 – Calculating Emissions

How are emissions calculated from the measured parameters?

E.g., I measure NO_x ppm, but my limit is expressed in lbs/mmBtu – how do I get from one unit to the other?

91

Part 60 – Calculating Emissions

Equations for use in Part 60 (and Part 75) are found in Appendix A, Test Method 19

Locate this method in your rule book

92

Part 60 – Calculating Emissions

Section 12.2 of Method 19 contains the equations needed to convert units of measure and calculate emissions.

Locate this section in your rule book

93

Part 60 – Calculating Emissions

§ 12.2 of Method 19

Which equation would be used to calculate a NO_x emission rate from measured NO_x concentration and measured O_2, both on a dry basis?

94

Part 60 – Calculating Emissions

NO_x is typically measured in units of parts per million (ppm).

In what units of measure is "C_d" from Equation 19-1?

95

Part 60 – Calculating Emissions

C_d is used in Eq. 19-1 in units of lb/scf – not our standard units of measure.

How do we convert?

Check out Table 19-1 at the end of Method 19

96

Part 60 – Calculating Emissions

Table 19-1 says to multiply ppm by 1.194×10^{-7} to get lb/scf NO_x

So this conversion would need to be added to our Eq. 19-1 to compute NO_x rate from dry O_2 and dry NO_x

97

Part 60 – Calculating Emissions

Equation 19-1 also used a parameter called "F_d"

$$E = C_d x\, F_d\, x \left(\frac{20.9}{20.9 - \%O_{2d}}\right)$$

What is this?

98

Part 60 – Calculating Emissions

"F_d" is a dry-basis fuel factor:
Volume of dry flue gas : calorific value of fuel

F_c is a carbon-based fuel factor:
Volume of CO_2 : calorific value of fuel

99

Part 60 – Calculating Emissions

Find Table 19-2 to see the listing of fuel factors

What is the F_c factor for natural gas?

100

Part 60 – Calculating Emissions

Example #2

Which equation would be used to calculate a NO_x emission rate from measured NO_x concentration and measured CO_2, both on a dry basis?

Besides the diluent variable, what else changes in this equation as compared to Equation 19-1?

101

Part 60 – Calculating Emissions

Sometimes, moisture needs to be accounted for in the equations.

What are the moisture bases for the two measured parameters in Equation 19-4, and what new parameter has been added?

102

Part 60 – Calculating Emissions

Equation 19-4:

$$E = \frac{(C_w \; x \; F_d) x \; 20.9}{(1 - B_{ws}) x \; (20.9 \; - \%O_{2d})}$$

Pollutant concentration is wet (C_w)
Oxygen percentage is dry ($\%O_{2d}$)
The new constituent is moisture (B_{ws})

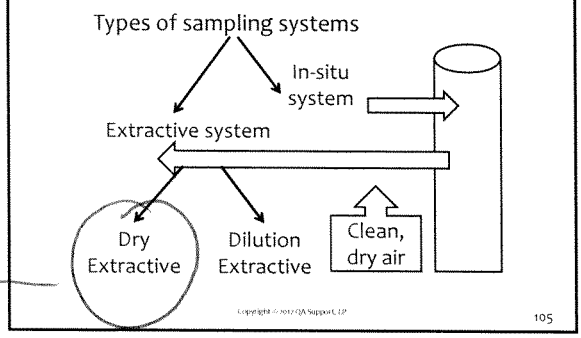
103

Part 60 – Calculating Emissions

When using equations, the moisture basis of the pollutant concentration and the diluent must be on a consistent basis
(i.e., both wet or both dry)

104

Part 60 – Calculating Emissions



105

Part 60 – Calculating Emissions

Characteristics of the different sampling system types:

	In-Situ	*Dry (Straight) Extractive*	*Dilution Extractive*
	Wet	Dry	Wet
Good for	Constituents not suited for transport (H_2O, volumetric flow)	Low-concentration pollutants	High-concentration pollutants, high-corrosion pollutants (SO_3)
Drawbacks	Difficult to maintain equipment, as it is generally elevated	Sample line must be heated to prevent condensing of pollutant	Sensitive to changes in stack P&T

106

Part 60 – Calculating Emissions

Subpart D limits for SO_2 and NO_x are:

Pollutant	*Liquid Fuel*	*Gaseous Fuel*	*Solid Fuel*
SO2	0.80 lb/mmBtu	No limit	1.2 lb/mmBtu
NOx	0.30 lb/mmBtu	0.20 lb/mmBtu	0.70 lb/mmBtu

Based on 3-hour rolling averages

107

Part 60 – Calculating Emissions

What is a rolling average?

What is a block average?

108

Part 60 – Calculating Emissions

Rolling average:

Hour 00 = 111.11
Hour 01 = 222.22
Hour 02 = 333.33
Hour 03 = 444.44
Hour 04 = 555.55
Hour 05 = 666.66

Rolled avg. for Hour 02

Rolled avg. for Hour 03

Rolled avg. for Hour 04

109

Part 60 – Calculating Emissions

Block average:

Hour 00 = 111.11
Hour 01 = 222.22
Hour 02 = 333.33

Block for Hour 02

Hour 03 = 444.44
Hour 04 = 555.55
Hour 05 = 666.66

Block for Hour 05

Consists of all the valid 1-hour averages that occur for each of the eight 3-hour periods in a calendar day (hours 00-02, 03-05, 06-08, 09-11, 12-14, 15-17, 18-20, 21-23)

110

Part 60 – Calculating Emissions

Given this data set:

01	1.11 lb/mmBtu
02	missing data
03	1.31 lb/mmBtu
04	1.29 lb/mmBtu

Does the 3-hour average for hour 03 exceed the emission limit of 1.2 lb/mmBtu?

111

Round # before compare

QA Part 60 – Calculating Emissions

Should be defined by the Subpart, but generally is not….. so, you need to define it:

- Does it consist of all the valid 1-hour averages that occur for the previous / successive ***operating*** or ***clock*** hours?
- Does it reset after shutdown?
- How many valid hour averages are needed to constitute a valid multi-hour average?

112

QA Part 60 – Calculating Emissions

Many subparts issue an opacity limit of:

- 20% for any 6-minute clock period
- One 6-minute period is allowed, not to exceed 27%

113

QA Part 60 – Calculating Emissions

Given the data set on the following slide, how many exceedances occurred during the hour shown?

114

Part 60 – Calculating Emissions

6-Minute Average	Opacity Emissions	6-Minute Average	Opacity Emissions
08:00-08:05	9.1%	08:30-08:35	20.2%
08:06-08:11	9.9%	08:36-08:41	21.5%
08:12-08:17	8.7%	08:42-08:47	22.7%
08:18-08:23	8.8%	08:48-08:53	27.8%
08:24-08:29	9.0%	08:54-08:59	19.8%

Limit is 20% per 6-minute period, with one "freebie" of 20-27%

ROUND DOWN TO MAKE 20% = In compliance

115

Part 60 – Calculating Emissions

6-Minute Average	Opacity Emissions	6-Minute Average	Opacity Emissions
08:00-08:05	9.1%	08:30-08:35	20.2%
08:06-08:11	9.9%	08:36-08:41	21.5%
08:12-08:17	8.7%	08:42-08:47	22.7%
08:18-08:23	8.8%	08:48-08:53	27.8%
08:24-08:29	9.0%	08:54-08:59	19.8%

Limit is 20% per 6-minute period, with one "freebie" of 20-27%

116

12/12/13

Ongoing QA/QC Requirements

Periodic test

117

Part 60 – Ongoing QA/QC

Ongoing QA/QC requirements are found in Appendix F

- For analyzers used by all subparts to demonstrate compliance w/NSPS (and often, with permit limits)
- Note that some state agencies specify more stringent requirements than P60
- Always consult your air operating permit to know which tests and PS's apply!

118

Part 60 – Ongoing QA/QC

Tests are specified in Appendix F

Locate §5 and identify the two tests discussed there

119

Two tests →
Relative Accuracy
Test Audit
3
Cylinder Gas Audit

Part 60 – Ongoing QA/QC

Tests are specified in §5

- CGA
- RATA (Relative Accuracy Test Audit)

And, of course, sources are required by Subpart A to perform:

- CEMS Daily cal check (same zero and upscale reference values as in 7-day drift)
- COMS Daily cal check

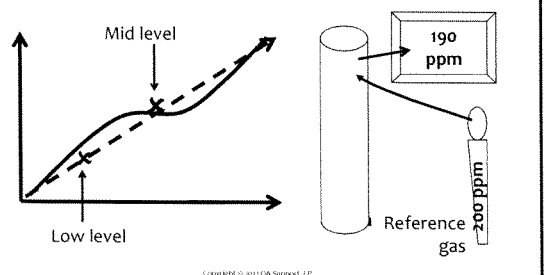
120

QA

CGA Test

121

QA Part 60 – Ongoing QA/QC – CGAs



122

QA Part 60 – Ongoing QA/QC – CGAs

Locate the test procedure for a CGA in Appendix F §5.1 and answer the questions on the following slide

123

QA Part 60 – Ongoing QA/QC – CGAs

Appendix F §5.1

1. What is the required spacing for audits?
2. How often is the CGA test performed?
3. How many points are checked?
4. How are those points defined?
5. How many injections at each point?

124

audited once each calendar quarter (no close to two months)

If conduct a RATA in (1) quarter don't need to conduct CGA

QA Part 60 – Ongoing QA/QC – CGAs

- 2 months' separation is required
- A cylinder gas audit (CGA) is required every quarter except for the quarter in which the RATA is performed
- Change to Appendix F § 5.1.4: If source is not operating in quarter when CGA is due, skip to next op quarter

New!

125

QA Part 60 – Ongoing QA/QC – CGAs

Make 3 injections for each of two levels, defined as:

Monitor	*Audit Point 1*	*Audit Point 2*
~~NO_x, SO_2, CO~~	~~20~~ to 30% of span	50 to 60% of span
CO_2	5 to 8% by volume	10 to 14% by volume
O_2	4 to 6% by volume	8 to 12% by volume

If you have an O_2 monitor with a span of 25%, do the reference cylinder values align with Part 75 linearity requirements?

126

Part 60 – Ongoing QA/QC – CGAs

The calculation for calculating the CGA result is Equation 1-1 in §6.3

Locate this section and identify the CGA equation

127

Part 60 – Ongoing QA/QC – CGAs

Equation 1-1:

$$A = \frac{C_m - C_a}{C_a}$$

Calculate the error at both levels

128

Part 60 – Ongoing QA/QC – GCAs

The performance specification is found in §5.2.3(2)

Locate this section and identify the PS

129

Part 60 – Ongoing QA/QC – CGAs

- Performance specification is 15% (average of the three injections)
  or 5 ppm
- Must pass at both levels

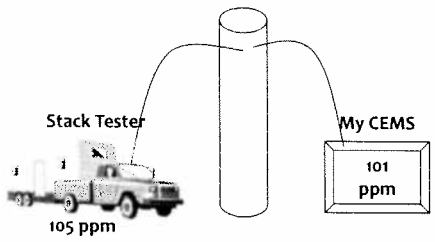
130

RATA

131

QA has the information for RATA testing

Part 60 – Ongoing QA/QC – RATAs



132

QA Part 60 – Ongoing QA/QC – RATAs

A RATA is required for all gaseous monitors and stack volumetric flow:

- Conduct once every 4 calendar quarters
- Change to Appendix F § 5.1.4: If source is not operating in quarter when RATA is due, skip to next op quarter

New!

133

QA Part 60 – Ongoing QA/QC – RATAs

§8.4 of PS-2 in Appendix B describes the procedure for a RATA

Locate this section and find answers to the questions on the next slide

134

QA Part 60 – Ongoing QA/QC – RATAs

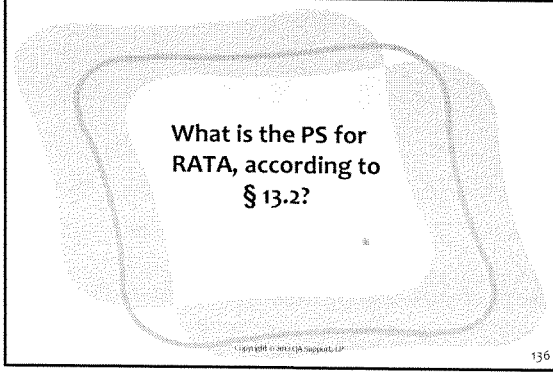
Appendix B, PS-2, §8.4

- At what load level should the unit be operating during the test?
- Can the RATA be performed during the 7-day calibration error drift test?
- How many comparison sets must be conducted?
- If more runs are made, how many may be discarded?

135

more than 50% of normal load
Yes during CD
minimum of 9 sets
as long as you do 9
but can only discard
maximum of 3

Part 60 – Ongoing QA/QC – RATAs



136

Part 60 – Ongoing QA/QC – RATAs

§13.2 says the relative accuracy must not exceed:

- 20% when the average RM value is used (when test emissions are >50% of the standard);
- 10% when the emissions standard is used (when test emissions are <50% of the standard

$$RA = \frac{\left[\left|\bar{d}\right| + \left|CC\right|\right]}{\overline{RM}} \; x \; 100$$

137

Part 60 – Ongoing QA/QC – RATAs

Alternative PS for low-emitting SO_2

- If your industry-specific emission standard is 0.20 to 0.30 lb/mmBtu:
  - RATA PS = 15% of standard
  - Example: if standard is 0.20 lb/mmBtu, the RATA PS is 15% * 0.20 = 0.03 lb/mmBtu
- If your industry-specific emission standard is <0.20 lb/mmBtu):
  - RATA PS = 20% of standard

138

Part 60 – Ongoing QA/QC – RATAs

Performance specifications for O_2/CO_2 are:

- 7-day drift test: 0.5% O_2/CO_2 for each level (zero, upscale) each day
- RATA: 1% O_2/CO_2
- From PS-3

139

Part 60 – Ongoing QA/QC – RATAs

Performance specifications for CO are:

- 7-day drift test: 5% of span for each level (zero, upscale) each day
- RATA: 10% when the RM value is used; 5% when the emission standard is used

From PS-4

- For instruments using PS-4A, APS for RATA is 5 ppm when using |RM-CEMS| + 2.5 CC

140

Opacity Monitor
Ongoing QA/QC

141

Part 60 – Ongoing QA/QC for Opacity

- Opacity monitoring systems have no ongoing QA/QC requirements, other than daily calibration drift
- However, some facilities perform the 3-filter test periodically; occasionally this is mandated by the facility's operating permit, a consent decree, or by state regulation

142

Proposed Opacity Procedure 3

143

Proposed Opacity Procedure 3

February 14, 2012 Federal Register

- Direct final rule
- Proposed May 8, 2003
- Effective April 16, 2012 unless adverse comments received by March 15
- Adverse comments were received; rule was withdrawn on March 28th
- New Procedure 3 in P60 Appendix F

144

QA Proposed Opacity Procedure 3

Procedure 3 contains:

- QA/QC procedures for:
  - Daily instrument checks
  - Quarterly performance audits
  - Annual zero alignment
- Minimum data collection requirements

--- more ---

145

QA Proposed Opacity Procedure 3

- Requirements for QA/QC program
- Data Assessment Report (DAR) specs
- Diagnostic & recertification testing reqmts
- Provision for temporary substitute monitor

146

QA Proposed Opacity Procedure 3

Quarterly testing:

- If instrument has automatic zero compensation, you must determine the amount of compensation (must be ≤4%)
- Check the optical alignment (misalignment error must be ≤3% opacity)
- Conduct a 3-point cal error test using 3 neutral density filters (calibration error must be ≤3%)

147

Proposed Opacity Procedure 3

Annual audit is a primary zero alignment under clear path conditions:

- Zero alignment error must not exceed 2% opacity

148

Proposed Opacity Procedure 3

Data capture requirements:

- Must obtain valid opacity data for ≥95% of the unit operating hours for a calendar quarter
- Downtime for routine zero/upscale cal checks and QA/QC audits required by Procedure 3 do NOT count toward monitor downtime

---more---

149

Proposed Opacity Procedure 3

- When minimum data collection requirements are not met:
  - Perform additional QA/QC activities to ensure acceptable data capture or
  - Determine if COMS is malfunctioning. May use a substitute COMS until repairs are made, as per §10.6

150

Proposed Opacity Procedure 3

New diagnostic test table (Table 17-1) in the rule containing details on various events and the required followup tests

151

Proposed Opacity Procedure 3

New provision to use a temporary substitute monitor as much as 720 hours per year

152

Proposed Opacity Procedure 3

New Data Assessment Report:

- Quarterly
- Performance audit results
- Summary of all corrective actions taken when the COMS was OOC

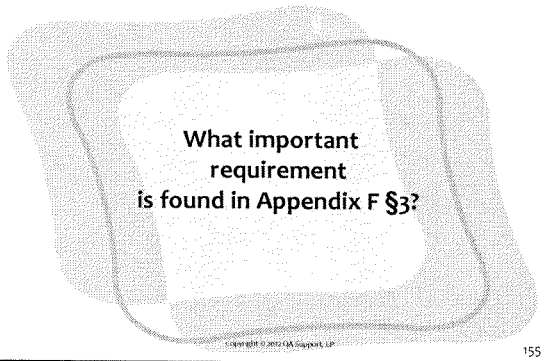
153

QA

QA/QC Program

154

QA **Part 60 – QA/QC Program**



155

written procedures →
step by step procedures

QA **Part 60 – QA/QC Program**

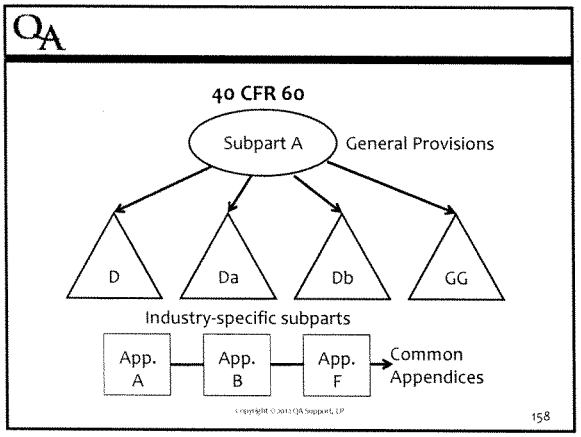
Section 3 requires sources to develop a Quality Control program that includes detailed, written, step-by-step procedures for…

156

Part 60 – QA/QC Program

- How to calibrate CEMS
- How to determine drift and adjust
- What preventive maintenance is needed
- A spare parts inventory
- How data is recorded, what calculations are used, and how reporting is done
- What QA activities are done and how
- How to fix a malfunctioning CEMS

157



158

Part 60 – Industry-Specific Subparts

For each industry-specific subpart, we will examine:

- Applicability
- What parameters have emission limits
- How compliance with limits is determined

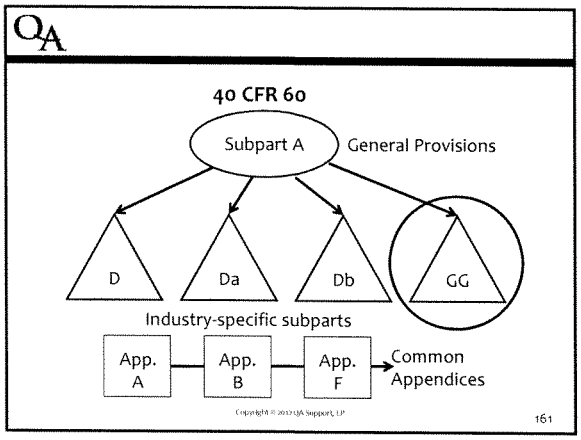
---more---

159

Part 60 – Industry-Specific Subparts

- Continuous monitoring requirements
  - Data validity
  - Averaging rules
  - Multi-hour averaging intervals and related definitions
- Any required sampling or parametric monitoring
- Recordkeeping & reporting requirements

160



161

Subpart GG
Stationary Gas Turbines

162

~~Unit built before 1997~~
1977.
older units

Part 60 – Subpart GG

Find §60.330(a) and see what types of units are covered under Subpart GG

163

Part 60 – Subpart GG

Affects stationary simple-cycle combustion turbines

- Max HI greater than 10 mmBtu/hr
- Constructed between 10/3/77 and 2/18/05
- Units built or modified after 2/18/05 are subject to KKKK

(§60.330(a))

164

Part 60 – Subpart GG

Limits exist for:

- NO_x – limit is based on unit size, fuel type, unit vintage, and type of NO_x controls used
- SO_2 – compliance is demonstrated by limiting the amount of sulfur in the fuel

165

Part 60 – Subpart GG

NO_x compliance options vary by unit vintage & controls used:

	Option 1	Option 2	Option 3
1977-2004			
Water or steam injection	Monitor fuel consumption to water inj. ratio	NO_x & O_2 CEMS (May be either P60 or P75)	None
No NO_x controls	NO_x & O_2 CEMS	Continue old state-approved procedure	None
2004-KKKK			
Water or steam injection	Monitor fuel consumption to water inj. ratio	NO_x & O_2 CEMS (May be either P60 or P75)	None
No NO_x controls	NO_x & O_2 CEMS	State-approved procedure of testing or parametric monitoring	Parametric monitoring according to turbine type

Part 60 – Subpart GG

When do you have excess emissions in Subpart GG?

See §60.334(j)

167

water to fuel ratio is too low

Part 60 – Subpart GG

Must report excess emissions relative to your selected monitoring option:

Monitoring Option	What Constitutes an Excess Emissions Event?
Water:fuel Ratio	Any hourly steam/water injection ratio that is lower than test-established minimum
CEMS	Any NO_x lbs/mmBtu 4-hour average value that is higher than limit in §60.332 (Note: can use diluent cap to lower rate)
Sulfur Sampling	%Sulfur in sample exceeds limit in §60.333
Combustion Parameters	When any 4-hr rolling average for any parameter does not meet its target value or operates outside the range defined in the plan

when to report an excess emission

Part 60 – Subpart GG

If using CEMS, data validation is specified:

- Full hour – Need 1 point per quadrant
- Partial hour – 1 point each operating quadrant
- QA hour – 2 points over the hour (2 quadrants)
- Unit operating hour – a clock hour during which any fuel is combusted

169

Part 60 – Subpart GG

There are no particular recordkeeping requirements under GG:

- Must report excess emissions
  - When CEMS measures a value exceeding the limit
  - %S too high in fuel or
  - Water-to-fuel injection ratio too low
- Follow instructions for EER in Subpart A

170

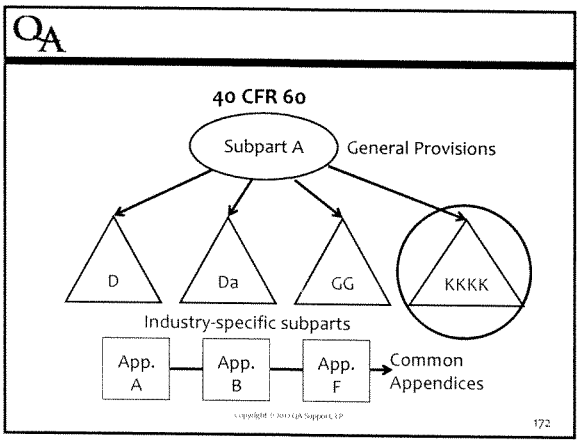
Part 60 – Subpart GG

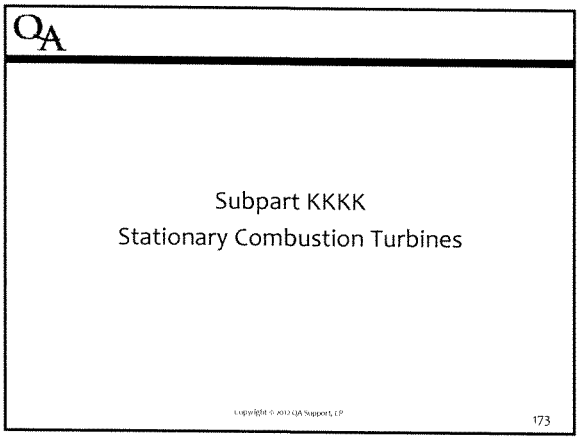
Must report downtime/missing data relative to your selected monitoring option:

Monitoring Option	*When is Data Missing?*
Water:fuel Ratio	Any hourly missing/invalid steam/water injection ratio
CEMS	Any missing/invalid CEMS (NOx or diluent) data
Sulfur Sampling	Sample not taken
Combustion Parameters	Any missing/invalid parameters

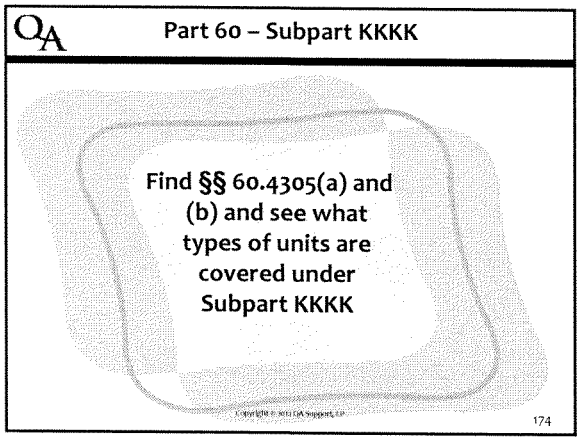
(§60.334(j))

171





Unit 25 is subpart KKKK for newer Combustion Turbines built after Feb 2005



Part 60 – Subpart KKKK

Affects these units:

- Max HI is greater than 10 mmBtu/hr
- Constructed, modified or reconstructed after 2/18/05

(§60.4305(a))

175

Part 60 – Subpart KKKK

- Limits exist for:
  - NO_x
    - Simple-cycle CTs w/o HRSG have a 4-hour rolling average compliance basis
    - Combined cycle units use a 30-unit op day rolling average compliance basis
  - SO_2

176

Part 60 – Subpart KKKK

- May comply using either:
  - Output-based standard (lb/MWh), or
  - Concentration-based (ppm corrected to 15% O_2)

177

WAPA uses ppm corrected

Part 60 – Subpart KKKK

NO_x compliance options:

	Option 1	*Option 2*	*Option 3*
Water or steam injection	Monitor fuel consumption to water inj. ratio	NO_x & O_2 CEMS (May be either P60 or P75)	Fuel flowmeter & wattmeter if complying w/output-based std
No NO_x controls	Annual performance testing (frequency may be less based on results)	NO_x & O_2 CEMS (May be either P60 or P75)	Parametric monitoring according to turbine type

178

Part 60 – Subpart KKKK

Must report excess emissions relative to your selected monitoring option – same as for Subpart GG

179

Part 60 – Subpart KKKK

- NO_x limits change according to the fuel combusted (see Table 1 in Subpart KKKK).
- Which limit applies in an hour during which a unit combusts multiple fuels?
  - If total HI is 50% from gas, then the gas limit applies
  - If total HI is 50% from oil, then the oil limit applies

(§ 60.4325)

180

Part 60 – Subpart KKKK

- Additionally, the limit to apply may change as operating conditions or ambient conditions change.
- In those situations, the limit is computed using the values in the table that correspond with the actual operation during each of those hours.

181

Part 60 – Subpart KKKK

For example, let's say my unit is:

- A new turbine firing natural gas,
- An EGU, and
- Is rated at >30 MW
- Combustion at peak load is ≤50 mmBtu/hour

- The normal NOx limit is 42 ppm @ 15% O2 (or 2.3 lb/MW-hour), according to the first entry in Table 1.

182

Part 60 – Subpart KKKK

- But for periods when I operate at less than 75% of peak load, the NOx limit is 96 ppm @ 15% O2 (or 4.7 lb/MW-hour), according to the next-to-last entry in Table 1

183

Part 60 – Subpart KKKK

- Note on reading "type" box #12 and 13: In these entries, there are four turbine types listed:
  1. Those north of the Arctic Circle;
  2. Those that operate at less than 75% of peak load;
  3. Those that are offshore; and
  4. Those that operate at temperatures less than 0 degrees Fahrenheit.

184

Part 60 – Subpart KKKK

- What happens if during some 4-hour period (the timeframe on which compliance is based), the unit operates for part of the period at more than 75% of peak load, and the remainder of the period at less than 75%?
- In these situations, a 4-hour limit must be computed.

185

Part 60 – Subpart KKKK

- To calculate a four-hour limit:
  a. Determine the limit from the table for each hour based on that hour's operating conditions
  b. Sum all of the four hourly limits determined in step "a" and divide by 4

186

Part 60 – Subpart KKKK

To illustrate:

- Hour 01 – operating at 50% load – limit is 96 ppm, from type box #13
- Hour 02 – operating at 60% load – limit is 96 ppm, from type box #13
- Hour 03 – operating at 80% load – limit is 42 ppm, from type box #1
- Hour 04 – operating at 90% load – limit is 42 ppm, from type box #1
- (96+96+42+42) / 4 = 69 ppm @ 15% O2

187

Part 60 – Subpart KKKK

Data validation if using CEMS (§60.4345(b)):

- Unit operating hour – a clock hour during which any fuel is combusted
- Full hour – Need 1 point per quadrant
- Partial hour – 1 point each operating quadrant
- QA hour – 2 points over the hour (2 quadrants)
- 3 valid hours are needed for a valid 4-hour average
- 75% of operating hours need to be valid to calculate a 30-day average

188

Part 60 – Subpart KKKK

- Reduce all data to hourly averages
- Calculate NO_x emission rate in units of ppm or lb/mmBtu
- Do not correct to NO_x to 15% O_2 ???
- Diluent cap can be used (19.0% O_2)
- Must include SSM times

(§ 60.4375(a))

189

start up/shut down → O2 is close to ambient making the NOx level high → to avoid use the diluent cap

Part 60 – Subpart KKKK

Fuel sampling requirements (§60.4370):

- Gas – sample once per day (unless exempt or on custom schedule)
- Oil – choose from options in Part 75 Appendix D:
  - Flow proportional
  - Daily sampling
  - Storage tank
  - Each delivery

190

NSPS Summary

191

NSPS Program Summary

What is the fundamental purpose of the NSPS Program?

192

compliance of limit

NSPS Program Summary

Other Subparts in Part 60:

- Ca – Large Municipal Waste Combustors Built <1994
- Ea – Municipal Waste Combustors Built 1989 to 1994
- Eb – Municipal Waste Combustors Built after 1994
- F – Portland Cement Plants
- J and Ja – Petroleum Refineries
- BB – Kraft Pulp Mills

193

NSPS Program Summary

If you decided to build a new simple-cycle combustion turbine, which NSPS Subparts would apply?

194

End of module

195

APPENDIX C.4

CFR Titles

2007 CFR Index and Finding Aids
2007 Title 1: General Provisions
2007 Title 2: Grants and Agreements
2007 Title 3: The President
2007 Title 4: Accounts
2007 Title 5: Administrative Personnel
2007 Title 6: Homeland Security
2007 Title 7: Agriculture
2007 Title 8: Aliens and Nationality
2007 Title 9: Animals and Animal Products
2007 Title 10: Energy
2007 Title 11: Federal Elections
2007 Title 12: Banks and Banking
2007 Title 13: Business Credit and Assistance
2007 Title 14: Aeronautics and Space
2007 Title 15: Commerce and Foreign Trade
2007 Title 16: Commercial Practices
2007 Title 17: Commodity and Securities Exchanges
2007 Title 18: Conservation of Power and Water Resources
2007 Title 19: Customs Duties
2007 Title 20: Employees' Benefits
2007 Title 21: Food and Drugs
2007 Title 22: Foreign Relation
2007 Title 23: Highways
2007 Title 24: Housing and Urban Development
2007 Title 25: Indians
2007 Title 26: Internal Revenue
2007 Title 27: Alcohol, Tobacco Products and Firearms
2007 Title 28: Judicial Administration
2007 Title 29: Labor/OSHA
2007 Title 30: Mineral Resources
2007 Title 31: Money and Finance: Treasury
2007 Title 32: National Defense
2007 Title 33: Navigation & Navigable Waters
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2007 Title 37: Patents, Trademarks, and Copyrights
2007 Title 38: Pensions, Bonuses, and Veterans' Relief
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SUMMARY REPORT - GASEOUS AND OPACITY EXCESS EMISSION AND MONITORING SYSTEM PERFORMANCE

Pollutant:	NO_x
Reporting Period:	January 1, 2007 to March 31, 2007
Company:	Incredibly Kleen Power, Inc.
Emission Limitation:	0.70 lb/mmBtu
Address:	123 Main Street, Anywhere, USA
Monitor Manufacturer and Model	TECO 42i
Date of Latest CMS Certification or Audit	CGA on March 1, 2007
Process Unit Description:	Unit 1 - Coal-fired electric generating unit

Total source operating time in reporting period[1]: 2,078 hours

Emission data summary[1]		CMS performance summary[1]	
1. Duration of excess emissions in reporting period due to:		1. CMS downtime in reporting period due to:	
a. Startup/shutdown	5	a. Monitor equipment malfunction	25
b. Control equipment problems	1	b. Non-monitor equipment malfunctions	1
c. Process problems	0	c. Quality assurance calibration	3
d. Other known causes	0	d. Other known causes	0
e. Unknown causes	0	e. Unknown causes	0
2. Total duration of excess emissions	6	2. Total CMS downtime	29
3. Total duration of excess emissions x (100) / [Total sources operating time]	%	3. [Total CMS Downtime] x (100) / [Total source operating time]	%

[1]For opacity, record all times in minutes. For gases, record all times in hours.

Questions

1. How many hours of excess emissions were reported for the quarter? 6
2. How many hours of excess emissions were reported as being due to control equipment problems? 1
3. Calculate the percentage of unit operating time for which excess emissions were reported .29%
4. How many hours of NO_x monitor downtime were reported for the quarter? 29
5. How many hours of NO_x monitor downtime were due to monitor equipment malfunction? 25
6. Calculate the percentage of unit operating time for which monitor downtime was reported 1.4%
7. What is the PMA for the NO_x monitor for this quarter? 98.6%

WAPA IS DRY EXTRACTIVE CEMS

Question 13.21 NEW

Topic: Recertification and Diagnostic testing

Background: According to § 75.20(b), "whenever the owner or operator makes a replacement, modification, or change in the certified continuous emission monitoring system or continuous opacity monitoring system that may significantly affect the ability of the system to accurately measure or record the SO_2 or CO_2 concentration, stack gas volumetric flow rate, NO_x emission rate, percent moisture, or opacity, or to meet the requirements of § 75.21 or appendix B to this part, the owner or operator shall recertify the continuous emission monitoring system or continuous opacity monitoring system according to the procedures in this paragraph."

Section 75.20(b) goes on to give the following examples of events which require recertification: "replacement of the analyzer; change in location or orientation of the sampling probe or site; and complete replacement of an existing continuous emission monitoring system or continuous opacity monitoring system. The owner or operator shall recertify a continuous opacity monitoring system whenever the monitor path length changes or as required by an applicable State or local regulation or permit."

Section 75.20(b)(1) states that "for all recertification testing, the owner or operator shall complete all initial certification tests in paragraph (c) of this section that are applicable to the monitoring system, except as otherwise approved by the Administrator."

Section 75.20(b) also states that "any change to a flow monitor or gas monitor for which a RATA is not necessary shall not be considered a recertification event. In such cases, any other tests that are necessary to ensure continued proper operation of the monitoring system (e.g., 3-load flow RATAs following changes to flow monitor polynomial coefficients, linearity checks, calibration error tests, DAHS verifications, etc.) shall be performed as diagnostic tests, rather than as recertification tests."

Question: Can EPA provide guidance on recertification and diagnostic test events and the appropriate quality-assurance tests for each event?

Answer: The following Tables describe various events as either recertification events or diagnostic test events and outline the appropriate tests to be performed for each event. The Tables clarify which types of changes to a monitoring system may "significantly affect the ability of the system to accurately measure or record" emissions or flow rate and therefore require recertification testing and which types of changes require less rigorous diagnostic testing "to ensure continued proper operation of the monitoring system."

The recertification events listed in the Tables include the examples given in § 75.20(b) (i.e., analyzer replacements, complete monitoring system replacements, and changes in probe location). The Tables also identify other

events that EPA believes are likely to have the potential to significantly affect the accuracy of the monitoring system and that EPA therefore intends to treat as recertification events in applying § 75.20(b). These events are: (1) changing from in-stack dilution methodology to out-of-stack dilution methodology; and (2) replacement of the critical orifice in a dilution extractive system with an orifice of a different size.

Section 75.20(b)(1) specifies that for recertification, the same battery of tests which was performed for initial certification must be repeated, unless otherwise approved by the Administrator. The Tables reflect EPA's intention to require, for most of the recertification events listed in the Tables, the full battery of certification tests to be repeated. However, note that in a number of instances, EPA intends to exercise its authority under § 75.20 (b)(1) to require less than the full battery of tests.

The diagnostic test events listed in the Tables are the types of component replacements and repairs which are most commonly done on continuous monitoring systems. The Tables reflect EPA's intention to require only certain tests for these events. The diagnostic tests listed for each event are consistent with case-by-case determinations previously made by EPA and are tests that EPA believes are likely to be necessary to ensure continued proper operation of the monitoring system. To reduce the testing burden, EPA is allowing two simplified diagnostic tests to be performed in lieu of more rigorous tests, in some cases. The simplified diagnostic tests (which are described in greater detail in the Addendum following the Tables) are as follows:

(1) Abbreviated Linearity Check - This test may be performed in some instances, in lieu of a full linearity check. The test consists of a single sequence of injections of low (20-30% of span), mid (50-60% of span) and high (80-100% of span) calibration gases. The results of the test are acceptable if the linearity error (LE) does not exceed 5.0% of the reference gas tag value (or, alternatively, for low-emitters, if $|R - A|$ does not exceed 5 ppm), at all three gas levels. If these specifications are not met, a full, "hands-off" linearity check must be performed; and

(2) Alternative System Response Check - This test may be performed in some instances, in lieu of a cycle time test. The test can be done as part of a daily calibration error test, by using a timer (e.g., a stopwatch) to determine how long it takes for the monitor reading to reach 95% of the upscale calibration gas tag value. The results are acceptable if the 15 minute cycle time specification in Part 75, Appendix A is met.

EPA notes that § 75.63(a)(2) requires, for all recertification events, submission of a recertification application no later than 45 days after completion of the required tests. However, the regulations do not require submittal of a formal application for approval after completion of diagnostic tests.

Sections 75.64(a)(2), 75.65 and 75.63 (a)(2)(iii) require that recertification test results and the results of diagnostic tests be submitted electronically in the appropriate quarterly EDR report. In accordance with § 75.64(d) and with section III.C (19) of the EDR Version 2.1/2.2 Reporting Instructions, EDR record type 556 is used for this purpose. However, note that RT 556 is not required for events where the only required tests are daily calibration error checks and/or the simplified diagnostic tests described above.

EPA recognizes that this guidance cannot possibly address every situation that may arise and is not binding for situations that it does address. You may want to contact EPA concerning your specific situation, particularly in cases where:

(1) An event occurs that is not listed in the Tables, and you do not know which (if any) tests are required; or

(b) An event occurs which is listed in the Tables, but for which you believe, based on sound engineering judgment or other technical considerations, that the tests listed in the Tables may be inappropriate or unnecessary.

Note: EPA has not included a table for opacity monitors in this policy guidance. The proper recertification and diagnostic tests for a continuous opacity monitoring system (COMS) are the tests required by Performance Specification 1 (PS-1) in Appendix B of 40 CFR, Part 60 and by any other applicable state or Federal regulation(s).

Recertification and Diagnostic Test Policy for Dry-Extractive CEMS [1]

Description of Event	Event	RAT	7 Day Cal	Cycle Time	Linearity	Calibration	Submit	Comments
Permanently replace NO_x, SO_2, O_2 or CO_2 analyzer with like-kind analyzer as defined in Part 75 Policy Manual Question 7.22.	R	X	X		X	X	X	The rule indicates that the permanent replacement of an analyzer is a recertification event. EPA does not require the cycle time test in this case, since the analyzer is like-kind and the rest of the system is the same. Modify RTs 510 and 530 as necessary.
Permanently replace NO_x, SO_2, O_2 or CO_2 analyzer with new analyzer which does not qualify as a like- kind analyzer.	R	X	X	X	X	X	X	Modify RTs 510, and 530 as necessary. The rule indicates that the permanent replacement of an analyzer is a recertification event. Thus, all tests are required.
Replace or repair any of the following components:								
Photomultiplier	D				(5)	X	A	EPA will conditionally allow the abbreviated linearity check and the alternative system response check (see footnotes (5) and (6)) For repair or replacement of other major components that are not listed here (e.g., major components of new monitoring technologies or monitoring technology not addressed in this policy), contact EPA for a case-by case ruling.
Lamp	D				(5)	X	A	
Internal analyzer particulate filter	D			(6)		X	A	
Analyzer vacuum pump	D			(6)	(5)	X	A	
Capillary tube	D			(6)	(5)	X	A	
Ozone generator	D				(5)	X	A	
Reaction chamber	D				(5)	X	A	
NO_2 converter	D				(5)	X	A	
Ozonator dryer	D				(5)	X	A	
Sample Cell	D				(5)	X	A	
Optical filters	D				(5)	X	A	
Replace or repair circuit board	D				(5)	X	A	EPA will conditionally allow the abbreviated linearity check (see footnote (5))
Replace, repair or perform routine maintenance (as specified in the QA/QC plan) on a minor analyzer component, including, but not limited to:								For repair or replacement of other minor components that are not listed here perform a diagnostic calibration error test. EPA recommends that each facility develop its own list of major and minor components and document this list within their QA/QC plan. If there is uncertainty whether a component is major or minor, contact EPA for a case-by-case ruling.
PMT base	D					X		
O-rings	D					X		
Optical windows	D					X		
High voltage power supply	D					X		
Zero air scrubber	D					X		
Thermistor	D					X		
Reaction chamber heater	D					X		
Photomultiplier cooler	D					X		
Photomultiplier cooler fins	D					X		
DC power supply	D					X		
Valve	D					X		
Display	D					X		
Replace or repair signal wiring in CEMS shelter.	D					X		

Recertification and Diagnostic Test Policy for Dry-Extractive CEMS (1)

Description of Event	Event	RAT	7 Day Cal	Cycle Time	Linearity	Calibration	Submit	Comments
Replace or repair sample tubing in CEMS shelter.	D					X		EPA recommends performing both a pressure and vacuum leak check. The term "sample tubing" includes any sample or calibration tubing, the sample or calibration manifold, and the solenoid valve.
Replace or repair vacuum pump or pressure pump (not the analyzer pumps)	D					X		EPA recommends that a leak check be performed, also.
Replace or repair moisture removal system (chiller).	D					X		EPA recommends performing both a pressure and vacuum leak check.
Replace CEMS probe (same probe length and location).	D					X		EPA recommends performing both a pressure and vacuum leak check.
Change probe length and/ or location.	R	X		(6)		X	X	The rule indicates that a probe location change is a recertification event. EPA will conditionally allow the alternative system response check to be performed (see footnote (6)).
Routine probe filter maintenance (e.g., clean or replace coarse filter).	D					X		
Permanently replace umbilical line.	D	X		(6)		X	X	EPA recommends performing both a pressure and vacuum leak check. EPA believes that permanently replacing an umbilical line can introduce bias into the system. Therefore, a RATA is necessary. Sources can use conditional data validation to minimize loss of data.
Replace probe heater or sample line heaters.	D					X		
Change from extractive CEMS to in-situ CEMS.	R	X	X	X	X	X	X	The rule indicates that the permanent replacement of a system is a recertification event. Thus, all tests are required. Modify RTs 510, 520, and 530, as necessary
Change from extractive CEMS to dilution CEMS.	R	X	X	X	X	X	X	The rule indicates that the permanent replacement of a system is a recertification event. Thus, all tests are required. Modify RT's 510, 520, and 530, as necessary

(1) The relevant tests for CEMS are listed in § 75.20 (c)(1).
(2) "R" means a recertification event, and "D" means diagnostic test event.
(3) The 7-day calibration error test is not required for a "regular" non-redundant backup system (§ 75.20(d)(2)(i)).
(4) A calibration error is required after every repair or corrective maintenance event that may affect system accuracy (Part 75, Appendix B, section 2.1.3 (a)). If conditional data validation is used, a probationary calibration error test is required (§ 75.20(b)(3)(ii)).

(5) A full, "hands-off" linearity check is recommended. However, an abbreviated linearity check is conditionally allowed (see Appendix, below). If the abbreviated test is not passed, consider it to be an aborted linearity check and perform a full linearity check. Note: SO_2 and NO_x monitors with span values $\leq$ 30 ppm are exempted from linearity checks.

(vi) A full cycle time test is recommended. However, the alternative system response check is conditionally allowed. If the system response check is not passed, perform a full cycle time test.

(X) "X" means that this test is required or that EDR record type 556 must be reported.

(A) Report EDR record type 556 only if the full linearity check or cycle time test is performed. Keep the results of all successful alternative diagnostic tests on-site and do not report them to EPA.

Recertification and Diagnostic Test Policy for Dilution-Extractive CEMS (1)

Description of Event	Event	RAT	7 Day Cal	Cycle Time	Linearity	Calibration	Submit	Comments
Permanently replace NO_x, SO_2, O_2 or CO_2 analyzer with like-kind analyzer as defined in the Part 75 Policy Manual, Question 7.22.	R	X	X		X	X	X	The rule indicates that the permanent replacement of an analyzer is a recertification event. EPA does not require the cycle time test in this case, since the analyzer is like-kind and the rest of the system is the same. Modify RTs 510 and 530 as necessary.
Permanently replace NO_x, SO_2, O_2 or CO_2 analyzer with new analyzer which does not qualify as a like- kind analyzer.	R	X	X	X	X	X	X	The rule indicates that the permanent replacement of an analyzer is a recertification event. Thus, all tests are required. Modify RT's 510, 530 as necessary.
Replace or repair any of the following components:								EPA will conditionally allow the abbreviated linearity check and the alternative system response check (see footnotes (5) and (6)) For repair or replacement of other major components that are not listed here (e.g., major components of new monitoring technologies or monitoring technology not addressed in this policy), contact EPA for a case-by case ruling.
Photomultiplier	D				(5)	X	A	
Lamp	D				(5)	X	A	
Internal analyzer particulate filter	D			(6)		X	A	
Analyzer vacuum pump	D			(6)	(5)	X	A	
Capillary tube	D			(6)	(5)	X	A	
Ozone generator	D				(5)	X	A	
Reaction chamber	D				(5)	X	A	
NO_2 converter	D				(5)	X	A	
Ozonator dryer	D				(5)	X	A	
Sample Cell	D				(5)	X	A	
Optical filters	D				(5)	X	A	
Replace or repair circuit board	D				(5)	X	A	EPA will conditionally allow the abbreviated linearity check (see footnote (5))
Replace, repair or perform routine maintenance (as specified in the QA/QC plan) on a minor analyzer component, including, but not limited to:								For repair or replacement of other minor components that are not listed here perform a diagnostic calibration error test. EPA recommends that each facility develop its own list of major and minor components and document this list within their QA/QC plan. If there is uncertainty whether a component is major or minor, contact EPA for a case-by-case ruling.
PMT base	D					X		
O-rings	D					X		
Optical windows	D					X		
High voltage power supply	D					X		
Thermistor	D					X		
Reaction chamber heater	D					X		
Photomultiplier cooler	D					X		
Photomultiplier cooler fins	D					X		
DC power supply	D					X		
Valve	D					X		
Display	D					X		

Recertification and Diagnostic Test Policy for Dilution-Extractive CEMS (1)

Description of Event	Event	RAT	7 Day Cal	Cycle Time	Linearity	Calibration	Submit	Comments
Replace or repair signal wiring in CEMS shelter.	D					X		
Replace or repair sample tubing in CEMS shelter.	D					X		EPA recommends performing both a pressure and vacuum leak check. The term "sample tubing" includes any sample or calibration tubing, the sample or calibration manifold, and the solenoid valve.
Replace or repair vacuum pump or pressure pump (not the analyzer pumps).	D					X		EPA recommends that a leak check be performed, also.
Replace critical orifice in dilution system with orifice of different size.	R	X	X	(6)	X	X	X	Changing the size of the critical orifice (outside the manufacturer's tolerances for individual orifices) will significantly change the dilution ratio, may cause moisture problems and could introduce additional bias into the CEM system. Therefore, recertification testing must be performed.
Replace critical orifice in dilution system with orifice of the same size (within the manufacturer's specified tolerance).	D				(5)	X	A	EPA will conditionally allow the abbreviated linearity check (see footnote (5)).
Disassemble and reassemble dilution probe for maintenance or service.	D				(5)	X	A	EPA recommends performing both a pressure and vacuum leak check. EPA will conditionally allow the abbreviated linearity check (see footnote (5)).
Permanently replace umbilical line.	D	X		(6)		X	X	EPA believes that permanently replacing an umbilical line can introduce bias into the system. Therefore, a RATA is necessary. Sources can use conditional data validation to minimize loss of data. EPA recommends performing both a pressure and vacuum leak check.
Replace CEMS probe (same probe length, location and dilution ratio).	D			(6)	(5)	X	A	Potential non-linear response with the new probe requires a linearity check. EPA will conditionally allow the abbreviated linearity check and the alternative system response check to be performed (see footnotes (5) and (6)). EPA recommends performing both a pressure and vacuum leak check.
Change probe length and/or location.	R	X		(6)		X	X	The rule indicates that a probe location change is a recertification event. EPA will conditionally allow the alternative system response check to be performed (see footnote (6)).
Routine probe filter maintenance (e.g., clean or replace coarse filter).	D					X		
Replace probe heater or sample line heaters.	D					X		

Recertification and Diagnostic Test Policy for Dilution-Extractive CEMS (1)

Description of Event	Event	RAT	7 Day Cal	Cycle Time	Linearity	Calibration	Submit	Comments
Change from dilution CEMS to in-situ CEMS.	R	X	X	X	X	X	X	The rule indicates that the permanent replacement of a system is a recertification event. Thus, all tests are required. Modify RTs 510, 520 and 530, as necessary
Change from dilution CEMS to extractive CEMS.	R	X	X	X	X	X	X	The rule indicates that the permanent replacement of a system is a recertification event. Thus, all tests are required. Modify RTs 510, 520, and 530, as necessary
Change from in-stack dilution to out-of-stack dilution methodology (or vice-versa).	R	X	X	X	X	X	X	EPA considers this to be equivalent to a monitoring system replacement. The rule indicates that the permanent replacement of a system is a recertification event. Thus, all tests are required.
Major modification to dilution air supply.	D				(5)	X	A	EPA will conditionally allow the abbreviated linearity check (see footnote (5)). EPA recommends performing both a pressure and vacuum leak check.

(vii) The relevant tests for CEMS are listed in § 75.20 (c)(1).

(2) "R" means a recertification event, and "D" means diagnostic test event.

(3) The 7-day calibration error test is not required for a "regular" non-redundant backup system (§ 75.20(d)(2)(i)).

(4) A calibration error is required after every repair or corrective maintenance event that may affect system accuracy (Part 75, Appendix B, section 2.1.3 (a)). If conditional data validation is used, a probationary calibration error test is required (§ 75.20 (b)(3)(ii)).

(5) A full, "hands-off" linearity check is recommended. However, an abbreviated linearity check is conditionally allowed (see Addendum, below). If the abbreviated test is not passed, consider it to be an aborted linearity check and perform a full linearity check. Note: SO_2 and NO_x monitors with span values $\leq$ 30 ppm are exempted from linearity checks.

(vi) A full cycle time test is recommended. However, the alternative system response check is conditionally allowed. If the system response check is not passed, perform a full cycle time test.

(X) "X" means that this test is required or that EDR record type 556 must be reported.

(A) Report EDR record type 556 only if the full linearity check or cycle time test is performed. Keep the results of all successful alternative diagnostic tests on-site and do not report them to EPA.

Recertification and Diagnostic Test Policy for In-situ CEMS [1]

Description of Event	Event	RAT	7 Day Cal	Cycle Time	Linearity	Calibration	Submit	Comments
Permanently replace NO_x, SO_2, O_2 or CO_2 analyzer with like-kind analyzer as defined in Part 75 Policy Manual Question 7.22.	R	X	X		X	X	X	The rule indicates that the permanent replacement of an analyzer is a recertification event. EPA does not require the cycle time test in this case, since the analyzer is like-kind and the rest of the system is the same. Modify RTs 510 and 530 as necessary.
Permanently replace NO_x, SO_2, O_2 or CO_2 analyzer with new analyzer which does not qualify as a like-kind analyzer.	R	X	X	X	X	X	X	The rule indicates that the permanent replacement of an analyzer is a recertification event. Thus, all tests are required. Modify RT's 510, 530 as necessary.
Replace or repair any of the following components:								EPA will conditionally allow the abbreviated linearity check (see footnote (5)). For repair or replacement of other major components that are not listed here, contact EPA for a case-by case ruling.
Light source	D				(5)	X	A	
Projection mirrors	D				(5)	X	A	
UV filter	D				(5)	X	A	
Fiberoptic cable	D				(5)	X	A	
Spectrometer grating	D				(5)	X	A	
Spectrometer mirrors	D				(5)	X	A	
Spectrometer mirror motor	D				(5)	X	A	
Replace or repair circuit board	D				(5)	X	A	EPA will conditionally allow the abbreviated linearity check (see footnote (5)).
Replace or repair minor analyzer component or perform routine analyzer maintenance (as specified in the QA/QC plan).	D					X		Examples include display, filter replacement, power cord replacement, power supply, valves, and analyzer pumps.
Change from in-situ to dry-extractive or dilution-extractive methodology.	R	X	X	X	X	X	X	The rule indicates that the permanent replacement of a system is a recertification event. Thus, all tests are required. Modify RT's 510, 520 and 530, as necessary.

Recertification and Diagnostic Test Policy for In-situ CEMS (1)

Description of Event	Event	RAT	7 Day Cal	Cycle Time	Linearity	Calibration	Submit	Comments
Change monitor location or measurement path	R	X	X			X	X	The 7-day calibration error test is required, since location changes may cause analyzer to drift, e.g., due to thermal effects or vibration. Modify RT's 510, 520, and 530, as necessary.

(1) The relevant tests for CEMS are listed in § 75.20 (c)(1).

(2) "R" means a recertification event, and "D"means diagnostic test event.

(3) The 7-day calibration error test is not required for a "regular" non-redundant backup system (see § 75.20(d)(2)(i)).

(4) A calibration error is required after every repair or corrective maintenance event that may affect system accuracy (Part 75, Appendix B, section 2.1.3 (a)). If conditional data validation is used, a probationary calibration error test is required (§ 75.20(b)(3)(ii)).

(5) A full, "hands-off" linearity check is recommended. However, an abbreviated linearity check is conditionally allowed (see Addendum, below). If the abbreviated test is not passed, consider it to be an aborted linearity check and perform a full linearity check. Note: SO_2 and NO_x monitors with span values $\leq$ 30 ppm are exempted from linearity checks.

(X) "X" means that this test is required or that EDR record type 556 must be reported.

(A) Report EDR record type 556 only if the full linearity check is performed. Keep the results of all successful alternative diagnostic tests on-site and do not report them to EPA.

Recertification and Diagnostic Test Policy for Flow Monitors (1)

Description of Event	Event	RATA	Abbreviated	Leak Check	7 Day Cal	Calibration	Report RT	Comments
Permanently replace flow monitor (includes like-kind monitor).	R	X		X	X	X	X	Edit RT 510 and 530 as needed.
Replace or repair major component of flow monitor, such as:								
Ultrasonic transducer	D		X			X	X	
Ultrasonic transducer interface (electronics)	D		X			X	X	
Differential Pressure Probe	D		X	X		X	X	Perform abbreviated flow to load ratio test. Perform a RATA if abbreviated flow to load test is failed. (Part 75, App. B, section 2.2.5.3). Note that there are no appropriate 600-level EDR records for reporting the abbreviated flow-to-load ratio diagnostic test. Therefore, only RT 556 is required when this diagnostic test is performed. Keep the test data and calculated results on-site, in a format suitable for inspection.
Differential Pressure Transducer/transmitter electronics	D		X	X		X	X	
Thermal Probe	D		X			X	X	
Thermal Electronics to condition/convert probe signal to calculated flow	D		X			X	X	
Replace or repair minor component of flow monitor, such as:								
Ultrasonic Purge system components, such as filters or fans	D					X		Perform any diagnostic testing as recommended by the manufacturer.
Differential Pressure Back-purge probe cleaning system components	D			X		X		
Thermal Probe cleaning system components	D					X		
Change polynomial coefficients or K factors used to compute flow.	D	X				X	X	3-load RATA required, except for monitors installed on peaking units and bypass stacks, which require only a normal-load RATA. (§75.20(c)(2)(ii)(A))

(1) The relevant tests for FLOW CEMS are listed in § 75.20 (c)(2) and Part 75, Appendix B, sections 2.2.2 and 2.2.5.3.

(2) "R" means a recertification event, and "D" means diagnostic test event.

(3) For differential pressure flow monitor only .

(4) The 7-day calibration error test is not required for a "regular" non-redundant backup system (see § 75.20 (d)(2)(i)).

(5) A calibration error is required after every maintenance event that may affect system accuracy (Appendix B, section 2.1.3 (a)). If conditional data validation is used, a probationary calibration error test is required (§ 75.20 (b)(3)(ii)).

(X) "X" means that this test is required or that EDR record type 556 must be reported.

Recertification and Diagnostic Test Policy for Flue Gas Moisture Sensors (1)

Description of Event	Event	RATA	Report RT 556	Comments
Permanently replace a flue gas moisture sensor	R	X	X	Edit RT 510 as necessary.
Replace or repair moisture sensor electronics.	D			Perform any diagnostic testing as recommended by the manufacturer.
Change the K-factor or mathematical algorithm used to compute percent moisture	D	X	X	If a K-factor or mathematical algorithm is used to set up the sensor vs. Method 4, the rule requires a diagnostic RATA whenever this K-factor or algorithm is changed.

(1) The relevant tests for a moisture meter are listed in § 75.20 (c)(6), Appendix A, section 6.5.7, and Appendix B, section 2.3

(2) "R" means a recertification event, and "D"means diagnostic test event.

(3) Moisture RATA consists of comparison with EPA Method 4

(X) "X" means that this test is required or that EDR record type 556 must be reported.

Recertification and Diagnostic Test Policy for Fuel Flowmeters (1)

Description of Event	Event	Flowmeter	Transmitter	Primary Element	Re-determine Flow	Report	Comments
Replace a fuel flowmeter with one certified by design (e.g., orifice, nozzle, or venturi-type).	R		X	X	X	X	Edit RT 510 and 540 as necessary.
Replace a fuel flowmeter with one certified by actual calibration.	R	X				X	Edit RT 510 and 540 as necessary.
Replace primary element of a fuel flowmeter that was certified by actual calibration.	D	X				X	Examples of primary elements include vortex shedding element of vortex fuel flowmeter, turbine of turbine meter, coriolis flow tubes or vibrating element of coriolis meter, and transmitters or transducers of ultrasonic meters.
Replace primary element of fuel flowmeter that was certified by design with an element of the same dimensions.	D			X		X	
Replace primary element of fuel flowmeter that was certified by design with an element of different dimensions.	D			X	X	X	
Replace or repair flowmeter electronics.	D						Perform any diagnostic testing as recommended by the manufacturer.

(1) The relevant tests for fuel flowmeter are listed in Part 75, Appendix D, sections 2.1.5 and 2.1.6.

(2) "R" means a recertification event, and "D" means diagnostic test event.

(3) Calibration by a reference flowmeter, by the manufacturer or by a laboratory (Part 75, Appendix D, section 2.1.5).

(4) Transmitter calibrations and primary element inspection only apply to orifice, nozzle and venturi-type fuel flowmeters (Part 75, Appendix D, sections 2.1.6.1 and 2.1.6.4).

(5) Redetermine orifice, nozzle or venturi flow coefficients using the procedures of AGA Report No. 3 or ASME MFC-3M whenever you change the size of the primary orifice, nozzle or venturi (Part 75, Appendix D, section 2.1.5.1)

(X) "X" means that this test is required or that EDR record type 556 must be reported.

Diagnostic Test Policy for DAHS [1]

Description of Event	Event	Formula	Missing Data	RATA	Linearity	Calibration	Submit	Comments
Replace entire DAHS (i.e., different vendor).	D	X	X			X	X	Modify RT 510 as necessary.
Upgrade DAHS to support a new EDR version using existing hardware, same equations and algorithms to calculate emissions data.	D	X	X				X	See Policy Manual question 14..96.
Change or insert new temperature, pressure or molecular weight correction algorithms[3] in DAHS, for dilution systems	D			X	X	X	X	EPA recommends these type of changes be made immediately prior to the RATAs for affected systems.
Change or insert mathematical algorithm[3] in DAHS, for correcting measured NO concentration to total NO_x	D			X		X	X	EPA recommends this type of change be made immediately prior to the RATA for affected system.
Change missing data algorithm in DAHS.	D		X				X	

(1) The relevant tests are listed in §§ 75.20 (c)(1) and (c)(9).
(2) "R" means a recertification event, and "D" means diagnostic test event.
(3) Contact EPA to discuss the appropriate diagnostic tests if other types of mathematical algorithms are changed or inserted in the DAHS
(X) "X" means that this test is required or that EDR record type 556 must be reported.

References: § 75.20(b), § 75.21, Appendix B

Key Words: Recertification Test Requirements, Diagnostic Testing

History: First published in October 2003 Revised Manual

Addendum: Alternative Diagnostic Tests

Introduction

For certain component repairs, replacements or other changes made to a monitoring system, EPA will conditionally allow alternative diagnostic tests to be performed, in lieu of a full Part 75 quality-assurance test. The conditions are that if the alternative test is failed, the monitoring system will be considered out-of-control until corrective actions are taken and a full Part 75 QA test of the same type has been passed, "hands-off." The results of successful alternative diagnostic tests need only be kept on-site (e.g., recorded in maintenance logs) and do not have to be reported to EPA.

Abbreviated Linearity Check

For gas monitors, an abbreviated linearity check is allowed in place of a full linearity check, wherever "(5)" is indicated in the "Linearity Check" column in the Tables above. The monitor must be "in-control" with respect to its RATA requirement before beginning this check (see Appendix B, section 2.2.3 (a)). The abbreviated linearity check procedure is as follows:

(1) Perform a "hands-off" calibration error test of the monitor. The calibration error for both the zero and upscale gases must be within the performance specifications in section 3.1 of Appendix A. That is:

- For SO_2 and NO_x monitors, the calibration error (CE) must not exceed 2.5% of the span value. Alternatively, for SO_2 or NO_x span values < 200 ppm, the results are acceptable if the absolute difference between the tag value of the reference gas and the analyzer response, i.e., $|R - A|$, does not exceed 5 ppm; or

- For CO_2 and O_2 monitors, the CE, expressed as $|R - A|$, must not exceed 0.5% CO_2 or O_2.

You may perform routine or non-routine calibration adjustments prior to the hands-off calibration error test, as described in sections 2.1.3 (b) and (c) of Appendix B.

(2) Following the hands-off daily calibration error test, check the linearity of the monitor (also "hands-off"), by performing 3 sequential calibration gas injections, i.e., one injection of a low-level gas (20-30% of span value), one mid-level gas injection (50-60% of span value) and one high-level injection (80-100% of span value). These three calibration gases are the same ones used for a full Part 75 linearity check. You may use the conditional data validation procedures in § 75.20 (b)(3) for the abbreviated linearity check. If you elect to use this option, the calibration error test in (1), above, may serve as the probationary calibration error test, and the abbreviated linearity check must be completed within 168 unit operating hours of the probationary calibration error test.

(3) The results of the abbreviated linearity check are acceptable if the Part 75 linearity specification is met for each gas injection. That is:

- For SO_2 and NO_x monitors, the linearity error (LE) must not exceed 5.0% of the tag value of the reference gas. Alternatively, the results are acceptable if $|R - A|$ does not exceed 5 ppm; or

- For CO_2 and O_2 monitors, the LE must not exceed 5.0% of the reference gas tag value. Alternatively, the results are acceptable if $|R - A|$ does not exceed 0.5% CO_2 or O_2.

(4) If the abbreviated linearity check is passed, keep the results on-site for inspection and audit purposes. Do not report the results to EPA. Report only the results of the hands-off calibration error test in EDR record type 230.

(5) If the abbreviated linearity check is failed, treat it as an aborted linearity check (see section 2.2.3 (b)(2) of Appendix B) and follow it up with a full linearity check. Use the data validation rules in section 2.2.3 (e) of Appendix B pertaining to aborted linearity checks. Since an aborted linearity check affects data validation, it must be reported to EPA in the electronic quarterly report (see section 2.2.3 (h) in Appendix B and the EDR Reporting Instructions for RT 601).

Alternative System Response Test

For gas monitors, an alternative system response test is allowed in place of a full cycle time test, wherever "(6)" is indicated in the "Cycle Time Test" column in the Tables above. The alternative system response test procedure is as follows:

(1) Initiate a daily calibration error check of the monitor.

(2) Wait until a stable reading with the zero-level calibration gas has been attained. Start a timer (e.g., a stopwatch) when injection of the upscale calibration gas begins.

(3) Stop the timer when the analyzer reading reaches the 95% response level (i.e., when the measured gas concentration has risen to a level that is within 5% of the tag value of the upscale calibration gas).

(4) The results of the alternative system response test are acceptable if the measured response time is $\leq$ 15 minutes.

(5) If the alternative system response time is failed, declare the monitor out-of-control. Follow up with a full cycle time test after corrective actions are taken.

EMISSIONS MATH EXERCISE

Using the raw hourly data provided below, determine which equation should be used to calculate the emissions value indicated, then compute the emissions.

Raw Data (all on a wet basis):

- SO_2 = 13.9 ppm
- NO_x = 62.0 ppm
- CO_2 = 9.9%
- Stack volumetric flow = 51,975,000 scfh
- Fuel = bituminous coal; F_c factor should be used
- Unit has operated for a full hour

Parameter to Calculate	Equation # to Use	Calculated Emissions
SO_2 lbs/hour (round to 1 decimal)		
NO_x lbs/mmBtu (round to 3 decimals)		
CO_2 tons/hour (round to 1 decimal)		
HI mmBtu/hour (round to 1 decimal)		
NO_x lbs/hour (round to 1 decimal)		

What other equation can be used to compute NO_x mass (lbs/hour)? _____

Do both calculations yield the same result? _____

$SO_2 = 1.660 \times 10^{-7} \times 13.9 \times 51,975,000$

Table 11
F-FACTOR REFERENCE TABLE

F-factor is the ratio of the gas volume of all the products of combustion (less water) to the heat content of the fuel. F_c-factor is the ratio of the gas volume of the CO_2 generated to the heat content of the fuel (see Part 75, Appendix F, Section 3.3).

Option 1: Fuel-Based Constants

Fuel		F-factor (dscf/mmBtu)	F_c-factor (scf CO_2/mmBtu)	F_w-factor (wscf/mmBtu)
Coal	Anthracite	10100	1970	10540
	Bituminous (or Sub-bituminous)	9780	1800	10640
	Lignite	9860	1910	11950
Gas	Natural Gas	8710	1040	10610
	Propane	8710	1190	10200
	Butane	8710	1250	10390
Oil	Oil	9190	1420	10320
Waste	Municipal Solid Waste	9570	1820	---
Wood	Bark	9600	1920	---
	Wood Residue	9240	1830	---

F-7A

$$F = \frac{3.64(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46(\%O)}{GCV} \times 10^6$$

F-7B

$$F_c = \frac{321 \times 10^3 \times (\%C)}{GCV}$$

19-14

$$F_w = \frac{5.57(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46(\%O) + 0.21(\%H_2O)}{GCV_w} \times 10^6$$

F = Dry-basis F-factor (dscf/mmBtu)
F_c = Carbon-based F-factor (scf CO_2/mmBtu)
F_w = Wet-basis F-factor (wscf/mmBtu)
%H,%N,%S, %C, %O,%H_2O = Content of element, percent by weight, as determined on the same basis as the gross calorific value by ultimate analysis of the fuel combusted using ASTM D3176-89 for solid fuels, ASTM D1945-91 or ASTM D1946-90 for gaseous fuels, as applicable
GCV = Gross calorific value (Btu/lb) of fuel combusted determined by ASTM D2015-91 for solid and liquid fuels or ASTM D1826-88 for gaseous fuels, as applicable
GCV_w = Calorific value (Btu/lb) of fuel combusted, wet basis

F-8*

$$F = \sum_{i=1}^{n} X_i F_i$$

$$F_c = \sum_{i=1}^{n} X_i (F_c)_i$$

F = Dry-basis F-factor (dscf/mmBtu)
F_c = Carbon-based F-factor (scf CO_2/mmBtu)
n = Number of fuels being combusted
F_i,$(F_c)_i$ = Applicable F or F_c factor for each fuel type
X_i = Fraction of total heat input derived from each type of fossil fuel

* This formula should be used for affected units that combust combinations of fossil fuels or fossil fuels and wood residue. For affected units that combust a combination of fossil and non-fossil fuels, the selected F-factor must receive State or EPA approval.

Table 12
SO_2 EMISSION RATE FORMULA REFERENCES

Monitoring Methodology	CEMS		Oil Fuel Flowmeter	Gas Fuel Flowmeter Other Gas	Gas Fuel Flowmeter PNG	Gas Fuel Flowmeter Natural Gas
Moisture Basis* (RT 510, Start Column 27)	WET	DRY				
Appropriate Hourly Formulas (Part 75, Appendices D&F)	F-1	F-2	D-2	D-4	D-5	D-1H

* IS, IS/P, IS/C, D/IN, D/OUT, DIL, WXT - wet; EXT - dry. Exceptions are possible. Check with vendor if uncertain.

Table 13
SO_2 EMISSION FORMULAS

Code	Formula	Where:
F-1	$E_h = K \times C_h \times Q_h$	E_h = Hourly SO_2 mass emission rate (lb/hr) K = 1.660 x 10^{-7} for SO_2 ((lb/scf)/ppm) C_{hp} = Hourly average SO_2 concentration (ppm (dry)) C_h = Hourly average SO_2 concentration (ppm (stack moisture basis)) Q_h and Q_{hs} = Hourly average volumetric flow rate (scfh (stack moisture basis) $\%H_2O$ = Hourly average stack moisture content (%by volume)
F-2	$E_h = K \times C_{hp} \times Q_{hs} \times \frac{100 - \%H_2O}{100}$	
D-1h	$ER = \frac{2.0}{7000} \times 10^6 \times \frac{S_{total}}{GCV}$	ER = Default SO_2 emission rate for natural gas (or "other" gaseous fuel) combustion (lb/mmBtu) S_{total} = Total sulfur content of gaseous fuel (grains/100 scf) GCV = Gross calorific value of the gas (Btu/100 scf) 2.0 = Ratio of lb SO_2/lb S 7000 = Conversion of grains/100 scf to lb/100 scf 10^6 = Conversion of Btu to mmBtu
D-2	$SO2_{rate-oil} = 2.0 \times OIL_{rate} \times \frac{\%S_{oil}}{100.0}$	$SO2_{rate-oil}$ = Hourly mass emission rate of SO_2 emitted from combustion of oil (lb/hr) OIL_{rate} = Mass rate of oil consumed per hour during combustion (lb/hr) $\%S_{oil}$ = Percent sulfur by weight measured in oil sample 2.0 = Ratio of lb SO_2 to lb S
D-3	$OIL_{rate} = V_{oil-rate} \times D_{oil}$	OIL_{rate} = Mass rate of oil consumed per hr (lb/hr) $V_{oil-rate}$ = Volume rate of oil consumed per hr, measured (scf/hr, gal/hr, barrels/hr, or m^3/hr) D_{oil} = Density of oil, measured (lb/scf, lb/gal, lb/barrel, or lb/m^3)

(cont.)

Table 13
SO_2 EMISSION FORMULAS (cont.)

Code	Formula	Where:
D-5	$SO2_{rate} = ER \times HI_{rate}$	$SO2_{rate}$ = Hourly mass emission rate of SO_2 from combustion of gaseous fuel (lb/hr) ER = SO_2 emission rate from Appendix D, Section 2.3.1.1 or Appendix D, Section 2.3.2.1.1 to Part 75 (lb/mmBtu) HI_{rate} = Hourly heat input rate of a gaseous fuel, calculated using procedures in Appendix D, Section 3.4.1 to Part 75 (mmBtu/hr)
F-23	$E_h = ER \times HI$	E_h = Hourly SO_2 mass emission rate (lb/hr) ER = Applicable SO_2 default emission rate from Appendix D, Section 2.3.1.1, or Appendix D, Section 2.3.2.1.1 to Part 75 (lb/mmBtu) HI = Hourly heat input rate, determined using a certified flow monitor and diluent monitor, according to Appendix F, Section 5.2 (mmBtu/hr)
D-12	$M_{SO2\text{-}hr} = \sum_{all\text{-}fuels} SO2_{rate\text{-}i} t_i$	$M_{SO2\text{-}hr}$ = Total mass of SO_2 emissions from all fuels combusted during the hour (lb) $SO2_{rate\text{-}i}$ = SO_2 mass emission rate for each type of gas or oil fuel combusted during the hour (lb/hr) t_i = Time each gas or oil fuel was combusted for the hour (fraction of an hour)

Table 14
NO_X EMISSION RATE FORMULA REFERENCE TABLE

Monitoring System Type		NO_x Emission Rate (CO_2 Diluent)				NO_x Emission Rate (O_2 Diluent)			
Moisture Basis	NO_x	DRY	DRY	WET	WET	DRY	DRY	WET	WET
	CO_2	DRY	WET	DRY	WET				
	O_2					DRY	WET	DRY	WET
Appropriate Hourly Formulas		19-6	19-9	19-8	19-7	19-1	19-5 or 19-5D	19-4	19-2, 19-3, or 19-3D

* IS, IS/P, IS/C, D/IN, D/OUT, DIL, WXT - wet; EXT - dry. Exceptions are possible. Check with vendor if uncertain.

Use of the Diluent Cap With Equations 19-3, 19-5, F-14B, and F-17

When using the diluent cap with Equations 19-3, 19-5, F-14B, and F-17 it is possible to have unrepresentative or negative results if the percent moisture is high. To avoid this problem, the Agency has developed special variations of these equations for use with the diluent cap. For any hour in which the diluent cap is used in place of Equations 19-3, 19-5, F-14B, and F-17, use the variations of these equations with the diluent cap in the following manner:

- If you use Equation 19-3 for NO_x emission rate, use Equation 19-3D for any hour in which you use the diluent cap.

- If you use Equation 19-5 for NO_x emission rate, use Equation 19-5D for any hour in which you use the diluent cap.

- If you use Equation F-14B to determine percent CO_2 from percent O_2, use Equation F-14D for any hour in which you use the diluent cap.

- If you use Equation F-17 for heat input, use Equation F-17D for any hour in which you use the diluent cap.

Include these formulas in RT 520 of your monitoring plan and report the formula ID in the appropriate hourly record type whenever the diluent cap is used.

Table 15
NO_X EMISSION RATE FORMULAS (LB/MMBTU)

Code	Formula	Where:
19-1 (F-5)	$E = K \times C_d \times F_d \times \frac{20.9}{20.9 - \%O_{2_d}}$	Formulas should be multiplied by the conversion factor "K" (if C_d or C_w is in ppm). FROM TO MULTIPLY BY "K" ppm NO_x lb/scf **K = 1.194 X 10^{-7}** E = Emission rate (lb/mmBtu) C_d = Pollutant concentration (ppm, dry basis) C_w = Pollutant concentration (ppm, wet basis) F_d = Dry-basis F-factor (dscf/mmBtu) F_c = Carbon-based F-factor (scf CO_2/mmBtu) F_w = Wet-basis F-factor (wscf/mmBtu) B_{wa} = Moisture fraction of ambient air (default value 0.027) $\%H_2O$ = Moisture content of effluent gas O_{2d} = Oxygen diluent concentration (percent of effluent gas, dry basis) O_{2w} = Oxygen diluent concentration (percent of effluent gas, wet basis) O_{2def} = Default diluent cap O_2 value (14.0% for boilers, 19.0% for combustion turbines) CO_{2d} = Carbon dioxide diluent concentration (percent of effluent gas, dry basis) CO_{2w} = Carbon dioxide diluent concentration (percent of effluent gas, wet basis)
19-2	$E = K \times C_w \times F_w \times \frac{20.9}{20.9\ (1 - B_{wa}) - \%O_{2_w}}$	
19-3*	$E = K \times C_w \times F_d \times \frac{20.9}{20.9 \times \left[\frac{100 - \%H_2O}{100}\right] - \%O_{2_w}}$	
19-3D*	$E = K \times C_w \times F_d \times \frac{20.9}{20.9 \times \left[\frac{100 - \%H_2O}{100}\right] - \%O_{2_{def}} \times \left[\frac{100 - \%H_2O}{100}\right]}$	
19-4*	$E = K \times \frac{(C_w \times F_d)}{(100 - \%H_2O) \div 100} \times \frac{20.9}{(20.9 - \%O_{2_d})}$	
19-5*	$E = \frac{20.9 \times K \times C_d \times F_d}{20.9 - \left[\%O_{2_w} \div \left(\frac{100 - \%H_2O}{100}\right)\right]}$	
19-5D	$E = K \times C_d \times F_d \times \frac{20.9}{20.9 - \%O_{2_{def}}}$	
19-6	$E = K \times C_d \times F_c \times \frac{100}{\%CO_{2_d}}$	
19-7 (F-6)	$E = K \times C_w \times F_c \times \frac{100}{\%CO_{2_w}}$	
19-8*	$E = K \times \frac{(C_w \times F_c)}{(100 - \%H_2O) \div 100} \times \frac{100}{\%CO_{2_d}}$	
19-9*	$E = K \times C_d \times \left[\frac{100 - \%H_2O}{100}\right] \times F_c \times \frac{100}{\%CO_{2_w}}$	

* Note that [(100 - % H2O/100] may also represented as (1 - B_{ws}), where B_{ws} is the proportion by volume of water vapor in the stack gas stream.

Table 16
MOISTURE FORMULAS*

Code	Formula	Where:
M-1	$\%H_2O = \frac{(O_{2_d} - O_{2_w})}{O_{2_d}} \times 100$	$\%H_2O$ = Percent Moisture O_{2_d} = Oxygen diluent concentration (percent of effluent gas, dry basis) O_{2_w} = Oxygen diluent concentration (percent of effluent gas, wet basis)
M-1K	$\%H_2O = \frac{(O_{2d} - O_{2w})}{O_{2d}} \times 100$, as adjusted[1]	

* Please contact the EPA Clean Air Markets Division for the assigned code for other moisture formulas.
[1] Using a K-factor or other mathematical algorithm, per Appendix A, Section 6.5.7(a).

Table 17
CO_2 FORMULA REFERENCE TABLE

Monitoring Method	CO_2 Concentration (O_2 CEMS)		CO_2 Mass Emissions (Fuel Sampling)	CO_2 Mass Emissions (Gas-fired Units)	CO_2 Concentration (CO_2 CEMS)	
Moisture Basis* (RT 510, Start Column 27)	WET	DRY			WET	DRY
Appropriate Formulas (Part 75, Appendices F, G)	F-14B or F-14D & F-11	F-14A & F-2	G-1, 2, 3 or 5 (App. G, 2.1, 3.1)	G-4, G-4A	F-11	F-2

* IS, IS/P, IS/C, D/IN, D/OUT, DIL, WXT - wet; EXT - dry. Exceptions are possible. Check with vendor if uncertain.

Table 18
CO_2 MASS EMISSION RATE FORMULAS

Code	Formula	Where:
F-2	$E_h = K \times C_{hp} \times Q_{hs} \times \frac{100 - \%H_2O}{100}$	E_h = Hourly CO_2 mass emissions (tons/hr) K = 5.7 x 10^{-7} for CO_2 ((tons/scf)/%CO_2) C_{hp} = Hourly average, CO_2 concentration (% CO_2, dry basis) Q_{hs} = Hourly average volumetric flow rate (scfh, wet basis) %H_2O = Hourly average stack moisture content (% by volume)
F-11	$E_h = K \times C_h \times Q_h$	E_h = Hourly CO_2 mass emission rate (tons/hr) K = 5.7x10^{-7} for CO_2 ((tons/scf)/%CO_2) C_h = Hourly average CO_2 concentration (%CO_2, wet basis) Q_h = Hourly average volumetric flow rate (scfh, wet basis)
F-14A	$CO_{2d} = 100 \times \frac{F_c}{F} \times \frac{20.9 - O_{2d}}{20.9}$	CO2d = Hourly average CO_2 concentration (percent by volume, dry basis) F = Dry-basis F-factor (dscf/mmBtu) F_c = Carbon-based F-factor (scf CO_2/mmBtu) 20.9 = Percentage of O_2 in ambient air O_{2d} = Hourly average O_2 concentration (percent by volume, dry basis)
F-14B	$CO_{2w} = \frac{100}{20.9} \times \frac{F_c}{F} \times \left[20.9\left(\frac{100 - \%H_2O}{100}\right) - O_{2W} \right]$	CO_{2w} = Hourly average CO_2 concentration (percent by volume, wet basis) F = Dry-basis F-factor (dscf/mmBtu) F_c = Carbon-based F-factor (scf CO_2/mmBtu) 20.9 = Percentage of O_2 in ambient air O_{2W} = Hourly average O_2 concentration (percent by volume, wet basis) %H_2O = Moisture content of gas in the stack (%)
F-14D	$CO_{2W} = \frac{100}{20.9} \times \frac{F_c}{F} \times \left(\frac{100 - \%H_2}{100}\right) \times \left(20.9 - O_{2\text{-}def}\right)$	CO_{2w} = Hourly average CO_2 concentration (percent by volume, wet basis) F = Dry-basis F-factor (dscf/mmBtu) F_c = Carbon-based F-factor (scf CO_2/mmBtu) 20.9 = Percentage of O_2 in ambient air $O_{2\text{-def}}$ = Default diluent cap O_2 value (14.0% for boilers, 19.0% for combustion turbines) %H_2O = Moisture content of gas in the stack (%)
G-1	$W_{CO_2} = \frac{\left(MW_c + MW_{O_2}\right) \times W_c}{2000\, MW_c}$	W_{CO_2} = CO_2 emitted from combustion (tons/day) MW_c = Molecular weight of carbon (12.0) MW_{O_2} = Molecular weight of oxygen (32.0) W_c = Carbon burned (lb/day) determined using fuel sampling and analysis and fuel feed rates*

(cont.)

Table 18
CO_2 MASS EMISSION RATE FORMULAS (cont.)

Code	Formula	Where:
G-2	$W_{NCO2} = W_{CO2} - \frac{MW_{CO2}}{MW_c} \times \left(\frac{A\%}{100}\right) \times \left(\frac{C\%}{100}\right) \times W_{COAL}$	W_{NCO2} = Net CO_2 mass emissions discharged to the atmosphere (tons/day) W_{CO2} = Daily CO_2 mass emissions calculated by Equation G-1 (tons/day) MW_{CO2} = Molecular weight of carbon dioxide (44.0) MW_c = Molecular weight of carbon (12.0) A% = Ash content of the coal sample (percent by weight) C% = Carbon content of ash (percent by weight) W_{COAL} = Feed rate of coal from company records (tons/day)
G-3	$W_{NCO2} = .99 \times W_{CO2}$	W_{NCO2} = Net CO_2 mass emissions from the combustion of coal discharged to the atmosphere (tons/day) .99 = Average fraction of coal converted into CO_2 upon combustion W_{CO2} = Daily CO_2 mass emissions from the combustion of coal calculated by Equation G-1 (tons/day)
G-4	$W_{CO_2} = \frac{F_c \times H \times U_f \times MW_{CO_2}}{2000}$	W_{CO_2} = CO_2 emitted from combustion (tons/hr) F_c = Carbon-based F-factor, 1,040 scf/mmBtu for natural gas; 1,420 scf/mmBtu for crude, residual, or distillate oil and calculated according to the procedures in Section 3.3.5 of Appendix F to Part 75 for other gaseous fuels H = Hourly heat input rate (mmBtu/hr) U_f = 1/385 scf CO_2/lb-mole at 14.7 psi and 68 °F MW_{CO_2} = Molecular weight of carbon dioxide (44.0)
G-4A	$CO2_{unit} = \frac{\sum_{all-fuels} CO2_{fuel} t_{fuel}}{t_{unit}}$	$CO2_{unit}$ = Unit CO_2 mass emission rate (tons/hr) $CO2_{fuel}$ = CO_2 mass emission rate calculated using Equation G-4 for a single fuel (tons/hr) t_{fuel} = Fuel usage time t_{unit} = Unit operating time
G-5	$SE_{CO_2} = W_{CaCO_3} \times F_u \times \frac{MW_{CO_2}}{MW_{CaCO_3}}$	SE_{CO_2} = CO_2 emitted from sorbent (tons/day) W_{CaCO_3} = Calcium carbonate used (tons/day) F_u = 1.00, the calcium to sulfur stoichiometric ratio MW_{CO_2} = Molecular weight of carbon dioxide (44) MW_{CaCO_3} = Molecular weight of calcium carbonate (100)

(cont.)

Table 18
CO_2 MASS EMISSION RATE FORMULAS (cont.)

Code	Formula	Where:
G-6	$SE_{CO_2} = F_u \frac{W_{SO_2}}{2000} \frac{MW_{CO2}}{MW_{SO_2}}$	SE_{CO_2} = CO_2 emitted from sorbent (tons/day) MW_{CO_2} = Molecular weight of carbon dioxide (44) MW_{SO_2} = Molecular weight of sulfur dioxide (64) W_{SO_2} = Sulfur dioxide removed (lb/day) based on applicable procedures, methods, and equations in § 75.15 F_u = 1.00, the calcium to sulfur stoichiometric ratio

* Collect at least one fuel sample during each week that the unit combusts coal, one sample per each shipment or delivery for oil and diesel fuel, and one fuel sample for each delivery for gaseous fuels in lots, for each daily or hourly gas sample for gaseous fuel that is required to be sampled daily or hourly for gross calorific value under Section 2.3.4.1 or 2.3.4.2 of Appendix D to Part 75. Collect coal samples from a location in the fuel handling system that provides a sample representative of the fuel bunkered or consumed during the week. Determine the carbon content of each fuel sampling using one of the following methods: ASTM D3178-89 or ASTM D5373-93 for coal; ASTM D5291 "Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants," ultimate analysis of oil, or computations based upon ASTM D3238-90 and either ASTM D2502-87 or ASTM D2503-82 (Reapproved 1987) for oil; and computations based on ASTM D1945-91 or ASTM D1946-90 for gas. Use daily fuel feed rates from company records for all fuels and the carbon content of the most recent fuel sample under this section to determine tons of carbon per day from combustion of each fuel. (All ASTM methods are incorporated by reference under § 75.6.) Where more than one fuel is combusted during a calendar day, calculate total tons of carbon for the day from all fuels.

Table 19
HEAT INPUT FORMULA REFERENCE TABLE

Monitor Type		Flow Monitor (Wet) and Diluent CEM				Fuel Flow and Fuel Sampling		
						Combusting Oil		Combusting Gas
Moisture Basis*	CO_2	WET	DRY			MASS	VOL	
	O_2			WET	DRY			
Appropriate Formulas (Part 75, Appendices D & F)		F-15	F-16	F-17 or F-17D	F-18	D-8 (F-19)	D-3 and D-8 (F-19)	D-6 (F-20)

* IS, IS/P, IS/C, D/IN, D/OUT, DIL, WXT - wet; EXT - dry. Exceptions are possible. Check with vendor if uncertain.

Table 20
HEAT INPUT FORMULAS

Code	Formula	Where:
D-15	$HI_{hr} = \sum_{all\text{-}fuels} HI_{rate\text{-}i} t_i$	HI_{hr} = Total heat input from all fuels combusted during the hour (mmBtu) $HI_{rate\text{-}hr}$ = Heat input rate from all fuels combusted during the hour (mmBtu/hr) $HI_{rate\text{-}i}$ = Heat input rate for each type of gas or oil combusted during the hour (mmBtu/hr) t_i = Time each gas or oil fuel was combusted for the hour (fuel usage time) (fraction of an hour) t_u = Operating time of the unit
D-15A	$HI_{rate\text{-}hr} = \frac{\sum_{all\text{-}fuels} HI_{rate\text{-}i} t_i}{t_u}$	
F-15	$HI = Q_w \times \frac{1}{F_c} \times \frac{\%CO_{2w}}{100}$	HI = Hourly heat input rate (mmBtu/hr) Q_w, Q_h = Hourly average volumetric flow rate (scfh, wet basis) F_c = Carbon-based F-factor (scf/mmBtu) F = Dry basis F-factor (dscf/mmBtu) $\%CO_{2w}$ = Hourly concentration of CO_2 (percent CO_2, wet basis) $\%CO_{2d}$ = Hourly concentration of CO_2 (percent CO_2, dry basis) $\%O_{2w}$ = Hourly concentration of O_2 (percent O_2, wet basis) $\%O_{2d}$ = Hourly concentration of O_2 (percent O_2, dry basis) $\%H_2O$ = Hourly average moisture of gas in the stack (%) O_{2def} = Default diluent cap O_2 value (percent O_2, wet basis) (14.0% for boilers, 19.0% for combustion turbines)
F-16	$HI = Q_h \times \left[\frac{100-\%H_2O}{100F_c}\right]\left[\frac{\%CO_{2d}}{100}\right]$	
F-17	$HI = Q_W \times \frac{1}{F} \times \frac{[(20.9/100)(100-\%H_2O)-\%O_{2w}]}{20.9}$	
F-17D	$HI = Q_W \times \frac{1}{F} \times \frac{\left(\frac{100-\%H_2O}{100}\right)(20.9-\%O_{2def})}{20.9}$	
F-18	$HI = Q_w \times \left[\frac{(100-\%H_2O)}{100F}\right]\left[\frac{(20.9-\%O_{2d})}{20.9}\right]$	
D-8** (F-19V)	$HI_{rate\text{-}oil} = OIL_{rate} \times \frac{GCV_{oil}}{10^6}$	$HI_{rate\text{-}oil}$ = Hourly heat input rate from combustion of oil (mmBtu/hr) OIL_{rate} = Rate of oil consumed (lb/hr for Eq. D-8 or gal/hr for Eq. F-19V) GCV_{oil} = Gross calorific value of oil (Btu/lb for Eq. D-8 or Btu/gal for Eq. F-19V) 10^6 = Conversion of Btu to mmBtu

(cont.)

Table 20
HEAT INPUT FORMULAS (cont.)

Code	Formula	Where:
F-19	$HI_o = M_o \times \frac{GCV_o}{10^6}$	HI_o = Hourly heat input rate from combustion of oil (mmBtu/hr) M_o , = Mass rate of oil consumed per hour (lb/hr) GCV_o, = Gross calorific value of oil (Btu/lb) 10^6 = Conversion of Btu to mmBtu
D-6	$HI_{rate-gas} = \frac{GAS_{rate} \times GCV_{gas}}{10^6}$	$HI_{rate-gas}$, HI_g = Hourly heat input rate from combustion of gaseous fuel (mmBtu/hr) GAS_{rate}, Q_g = Average volumetric flow rate of fuel (100 scfh) GCV_{gas} GCV_g = Gross calorific value of gaseous fuel (Btu/100 scf)* 10^6 = Conversion of Btu to mmBtu
F-20	$HI_g = \frac{(Q_g \times GCV_g)}{10^6}$	

** For non-Acid Rain Subpart H units, if you have a volumetric oil flowmeter, you may use Equation D-8 on a volumetric basis, rather than a mass basis. If you use this option, represent the Equation as F-19V in your monitoring plan.

Table 21
APPORTIONMENT AND SUMMATION FORMULAS

Code	Formula	Where:
F-21A	$HI_i = HI_{CS}\left(\frac{t_{CS}}{t_i}\right)\left[\frac{MW_i\ t_i}{\sum_{i=1}^{n} MW_i\ t_i}\right]$	HI_i = Heat input rate for a unit (mmBtu/hr) HI_{CS} = Heat input rate at the common stack or pipe (mmBtu/hr) MW_i = Gross electrical output (MWe) t_i = Operating time at a particular unit t_{CS} = Operating time at common stack or pipe n = Total number of units using the common stack or pipe i = Designation of a particular unit
F-21B	$HI_i = HI_{CS}\left(\frac{t_{CS}}{t_i}\right)\left[\frac{SF_i\ t_i}{\sum_{i=1}^{n} SF_i\ t_i}\right]$	HI_i = Heat input rate for a unit (mmBtu/hr) HI_{CS} = Heat input rate at the common stack or pipe (mmBtu/hr) n = Number of stacks or pipes SF_i = Gross steam load (flow) (lb/hr) t_i = Operating time at a particular unit t_{CS} = Operating time at common stack or pipe n = Total number of units using the common stack or pipe i = Designation of a particular unit

(cont.)

Table 21
APPORTIONMENT AND SUMMATION FORMULAS (cont.)

Code	Formula	Where:
F-21C	$HI_{Unit} = \frac{\sum_{s=1}^{n} HI_s \, t_s}{t_{Unit}}$	HI_{Unit} = Heat input rate for a unit (mmBtu/hr) HI_s = Heat input rate for each stack or duct (mmBtu/hr) t_{Unit} = Operating time for the unit t_s = Operating time for a particular stack or duct s = Designation of a particular stack or duct n = Total number stacks, ducts
F-21D	$HI_i = HI_{CP}\left(\frac{t_{CP}}{t_i}\right)\left[\frac{FF_i \, t_i}{\sum_{i=1}^{n} FF_i \, t_i}\right]$	HI_i = Heat input rate for a unit (mmBtu/hr) HI_{CP} = Heat input rate at the common pipe (mmBtu/hr) FF_i = Fuel flow rate to a particular unit (appropriate units) t_i = Operating time at a particular unit (hr) t_{CP} = Operating time at common pipe (hr) n = Total number of units using the common pipe i = Designation of a particular unit
F-25	$HI_{CS} = \frac{\sum_{u=1}^{p} HI_u \, t_u}{t_{CS}}$	HI_u = Hourly average heat input rate for a unit (mmBtu/hr) HI_{CS} = Hourly average heat input rate at the common stack (mmBtu/hr) p = Number of units t_u = Operating time at a particular unit t_{CS} = Operating time at common stack u = Designation of a particular unit

Table 22
NO_X MASS EMISSIONS FORMULAS (POUNDS)

Code	Formula	Where:
N-1 (F-26)*	$M_{NOx_h} = K \times C_{h_w} \times Q_h \times t_h$	M_{NOx_h} = Hourly NO_x mass emissions (lbs) K = 1.194 x 10^{-7} for NO_x ((lb/scf)/ppm) C_{h_d} = Hourly average, NO_x concentration (ppm (dry)) C_{h_w} = Hourly average, NO_x concentration, stack moisture basis (ppm (wet)) Q_h = Hourly average volumetric flow rate (scfh) $\%H_2O$ = Hourly average stack moisture content (% by volume) $M_{NOx_{fuel1}}$ = NO_x mass emissions from fuel 1 (lbs) $M_{NOx_{fuel2}}$ = NO_x mass emissions from fuel 2 (lbs) HI_h = Hourly average heat input rate (mmBtu/hr) t_h = Unit/stack operating time (hour or fraction of an hour) $E_{(NOx)_h}$ = Hourly average NO_x emission rate (lb/mmBtu)
N-2 (F-26)*	$M_{NOx_h} = K \times C_{h_d} \times Q_h \times \frac{(100-\%H_2O)}{100} \times t_h$	
N-3	$M_{NOx_h} = M_{NOx_{fuel1}} + M_{NOx_{fuel2}}$	
F-24	$M_{NOx_h} = E_{(NOx)h} \times HI_h \times t_h$	

* Equations N-1 and N-2 are equivalent to Equation F-26 in Appendix F to Part 75 (see Appendix F, Sections 8.2 and8.3). The right-hand side of Equation F-26 is E_h x t_h, where E_h is the hourly NO_x mass emission rate, in lb/hr and t_h is the unit or stack operating time, in hours. For purposes of program implementation, use codes N-1 and N-2 in RT 520, rather than F-26. The use of separate equation codes (i.e., N-1 and N-2) for wet and dry-basis NO_x measurements is preferable to using a single code (F-26), which does not indicate the moisture basis of the NO_x readings.

Table 23
MISCELLANEOUS FORMULA CODES

Code	Parameter	Description
N-GAS	FGAS	Net Gas fuel flow rate (100 scfh)
N-OIL	FOIL	Net Oil fuel flow rate (scf/hr, gal/hr, barrels/hr, or m^3/hr)
X-FL	FLOW	Average hourly stack flow rate (scfh). (To calculate the average of two or more primary flow monitors, for example, two ultrasonic monitors in an X-pattern.)
SS-1A	SO2	Total hourly SO_2 mass emissions from the affected unit(s) in a subtractive stack configuration (lb)
SS-1B	SO2	Hourly SO_2 mass emissions from a particular affected unit in a subtractive stack configuration (lb)
SS-2A	NOXM	Total hourly NO_x mass emissions from the affected unit(s) in a subtractive stack configuration (lb)
SS-2B	NOXM	Hourly NO_x mass emissions from a particular affected unit in a subtractive stack configuration (lb)
SS-2C	NOXM	Hourly NO_x mass emissions from a particular affected unit in a subtractive stack configuration (lb)

(cont.)

Table 23
MISCELLANEOUS FORMULA CODES (cont.)

Code	Parameter	Description
SS-3A	HI	Total hourly heat input for the affected unit(s) in a subtractive stack configuration (mmBtu)
SS-3B	HI	Hourly heat input rate for a particular affected unit in a subtractive stack configuration (mmBtu/hr)
NS-1	NOX	Hourly NO_x apportionment for NO_x affected units in a subtractive stack configuration (lb/mmBtu)
NS-2	NOX	Hourly NO_x apportionment for NO_x affected units using simple NO_x apportionment (lb/mmBtu)

Table 24
STANDARD UNITS OF MEASUREMENT

Parameter	Units
CO_2 and O_2 (as reported in RTs 210 and 211)	percent CO_2 or O_2
Stack Flow Rate (as reported in RT 220)	scfh
Gas Flow Rate (as reported in RT 303)	100 scf/hr
Moisture (as reported in RT 212)	percent H_2O
Mass Oil Flow Rate (as reported in RT 302)	lb/hr
NO_x Concentration (as reported in RT 201)	ppm
SO_2 Concentration (as reported in RT 200)	ppm
Volumetric Oil Flow Rate (as reported in RT 302)	scfh, gal/hr, m^3/hr, barrels/hr

Formula Text (23). Report in this 200 character field a representation of the formula, replacing its variables with the appropriate references to monitoring system IDs, component IDs, other formulas, and constants. Enter the formula in the order of calculation and with the constants as they appear in the tables above and operators as they appear in Table 25. If necessary, use parentheses; do not use brackets.

- **Component/System References**. Refer to systems as "S#(001-002)" where 001-002 is the component ID-system ID from RT 510, columns 10 and 13. This symbol represents the measurement value in the appropriate standard units of measurement for the parameter already adjusted for bias (if appropriate), temperature, and pressure. The following table lists the standard units of measurement assumed to be represented by each type of system.

- **Formula References**. Refer to other formulas as "F#(001)" where 001 is the Formula ID for another formula in RTs 520.

- **Constants**. You must also include any constants, such as unit conversion factors, fuel factors, etc., that are required for the calculation. Do not perform any intermediate calculations on the constants; your formula should have the same format as the equation in 40

LINEARITY TEST EXERCISE

Given the following injection data for a NO_x analyzer, determine whether this test passed or failed.

Low-level cylinder = 95.3 ppm
Mid-level cylinder = 270.0 ppm
High-level cylinder = 403.8 ppm

Injection #	Low Value Recorded	Mid Value Recorded	High Value Recorded
1	89.2	268.7	400.1
2	91.8	270.0	405.3
3	88.8	250.3	402.9

~~210.6~~ 263 402.7

89.9

$$LE = \frac{|R - A|}{R} x100$$

Where: R = Average of reference material
A = Average of CEMS readings

Level Tested	Average of 3 CEMS Readings	Result for Level
Low	89.9	~~95.66~~ 6%
Mid	263	2.59 → 3%
High	402.7	2.7

Does the test pass or fail? _____

MID

9435 1725 304

RATA EXERCISE

Using the RATA printout provided, answer the following questions about the test:

1. Which monitoring systems were tested?	System Parameter
2. How many levels were tested for the stack volumetric flow monitoring system?	low, mid, high
3. Was the testing accomplished in a single day?	
4. When did testing begin for the low-flow RATA, and when did it end?	midnight to next day
5. Which systems were tested simultaneously?	Nox, CO2 high flow
6. Did all of the systems achieve the annual testing frequency?	
7. Which system had the worst relative accuracy result?	low flow @ 5.78 (highest is bad)
8. Did any system need to use the alternative performance specification?	
9. Do any of the systems have a bias adjustment factor after this test?	
10. How many runs were made for each test?	9
11. How many traverse points were made for the high flow RATA?	20 stops across stack
12. When was the RM probe last calibrated?	Feb 4, 2004

Facility Name: Scrubgrass Generating Plant
Facility ID (ORISPL): 50974

QA/Cert Test Detail Report
August 28, 2008 09:13 AM

Unit/Stack/Pipe ID: 1

Relative Accuracy Test

System ID: 101
Test Number: EPA-101-2003
# of Op. Levels: 1
Evaluation Status: Not Evaluated
Submission Status: Not submitted
Submission Date:

System Parameter: NOXC
Reason for Test: QA

Test Completion: 08/25/2004 10:13
Reported Test Results: PASSED
EPA Calculated Result:
Reported BAF: 1.027
EPA Calculated BAF:
RATA Frequency:

Operating Level: High
Reference Method Used: 7E: NOX RM 7E

Summary Statistics:

	Reported	Recalculated		Reported	Recalculated
Mean of Monitoring System	59.522		**Relative Accuracy**	4.72	
Mean of Reference Method Values	61.100		**Bias Adjustment Factor**	1.027	
Mean of Difference	1.578		**APS Indicator**		
Standard Deviation of Difference	1.698		**T-Value**	2.306	
Confidence Coefficient	1.305		**Gross Unit Load or Velocity**	406	

Run Data:

Run	Start Date	End Date	Run Status	Monitoring System Value	Reference Method Value	Gross Load or Velocity
7	08/25/2004 08:45	08/25/2004 09:06	RUNUSED	65.100	67.100	406
6	08/25/2004 08:11	08/25/2004 08:32	RUNUSED	60.300	63.900	406
5	08/25/2004 07:37	08/25/2004 07:58	RUNUSED	59.500	60.900	406
3	08/25/2004 06:30	08/25/2004 06:51	RUNUSED	56.800	56.800	406
9	08/25/2004 09:52	08/25/2004 10:13	RUNUSED	65.100	69.300	406
1	08/25/2004 05:22	08/25/2004 05:43	RUNUSED	56.300	56.100	406
8	08/25/2004 09:18	08/25/2004 09:39	RUNUSED	61.000	63.700	406
2	08/25/2004 05:55	08/25/2004 06:16	RUNUSED	53.500	52.900	406
4	08/25/2004 07:04	08/25/2004 07:25	RUNUSED	58.100	59.200	406

APPENDIX D

PRORATED TRAVEL EXPENSES ASSOCIATED WITH ON-SITE TRAINING
AND
DCR FOR CLASSROOM TRAINING TRAVEL COSTS
THREE CLASSES

LISTEN. THINK. SOLVE.®

Rockwell Automation

VIWAPA

Systems Operation & Maintenance (Jan - Mar) and Environmental Monitoring System Training Expenses

Fixed Price Proposal

14-0617-VIW-06A-M-Rev. A

October 15, 2014

Global Solutions

Bringing You a World of Experience

Presented to:

VIWAPA
Maxwell George - Environmental Manager
St Thomas

Office:

Rockwell Automation Puerto Rico Inc
Calle 1 Metro Office Park 6
Suite 304
Guaynabo, PR 00968
(787) 658-1400

ROCKWELL AUTOMATION PUERTO RICO INC

To: Maxwell George
Environmental Manager
VIWAPA

Re: Systems Operation & Maintenance (Jan - Mar) and Environmental Monitoring System Training Expenses

Maxwell George:

Rockwell Automation is pleased to present to your attention this quotation for the Systems Operation & Maintenance (Jan - Mar) and Environmental Monitoring System Training Expenses. This is a Fixed Price Proposal, and it is issued –according to our best understanding of your needs- in response to your request.

The following are the documents composing Rockwell Automation's proposal.

Technical Document	Proposal Number: 14-0617-VIW-06A-M, Rev.A Date : October 15, 2014
Commercial Document	Proposal Number: 14-0617-VIW-06A-M, Rev.A Date : October 15, 2014
System Sale Agreement	All work to be performed under this Statement of Work is binding upon the parties by its acceptance and signature herein. The work will be subject to the terms and conditions of Contract # SC-47-13, its Addendums, Exhibits and Proposal 13-0212-VIW-01J-M.

Please make sure to contact us if any doubts, comments or concerns are aroused. We trust you will find our offer to be agreeable and favorable.

Sincerely,
Rockwell Automation

Edwin A Baez Aviles
Application Engineer

Patrick Owen
Account Sales Engineer

cc: Juan Carlos Ipiña
cc: Adolfo Oquero
cc: Mario Ricardo Alvarado

Revision History				
Reference:	**Date:**	**Description of change:**	**Edited by:**	**Revision:**
1	10/15/2014	Initial Release	JLHM	A

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STATEMENT OF WORK – (SOW)

1 Executive Summary

Rockwell Automation develops technologies and provides services that leading manufacturers around the world use to their competitive advantage. Whether running a single machine or an entire supply chain, manufacturers rely on their automation, power control, and conversion products and services to manage information flow from plant to plant, from plant floor to front office and from country to country to get their products and services to market faster, to reduce costs, to better utilize power and plant-floor assets, and to minimize risks in their manufacturing environments.

Rockwell Automation's Global Solutions Business organization provides value added solutions using the latest technologies in such areas as:

- Process Control Systems
- Burner and Combustion Control (boilers, etc.)
- Power and Energy Management Systems
- Information Management Systems
- Batch Management and Control Systems
- Material Handling Control Systems

As a Solution Provider, Global Solutions employs technologies using Rockwell Automation as well as non-Rockwell Automation control, computer equipment, software and engineering services.

Rockwell Automation's Global Solutions delivers best in class-engineered solutions to a diverse customer base.

1.1 Description of Services

This Change Order is to cover the expenses incurred for the VIWAPA Environmental Monitoring System Training performed by resources: Ray Fain, Tom Barnhart and Marsh Layman. Rockwell Automation is thankful to VIWAPA for the opportunity given to present the estimate of the "Systems Operation & Maintenance (Jan - Mar) and Environmental Monitoring System Training Expenses" which has been defined and built according to our best understanding of your needs. Rockwell Automation offers a leading industry solution to satisfy VIWAPA needs.

2 Technical Document

2.1 Additional Engineering Hours

The following table illustrates the additional hours provided in the additional Environmental Monitoring System Training Expenses Certifications (14-0617-VIW-06A-M Rev. A):

Service Date	Description	Regular	OT @ 1.5	OT @ 2.0
02-Jan-14	Service by Darren Humphries		1	
18-Jan-14	Service by Tom Barnhart		4	
19-Jan-14	Service by Darren Humphries			4
19-Jan-14	Service by Tom Barnhart			4
02-Feb-14	Service by Darren Humphries			4
22-Feb-14	Service by Darren Humphries		4	
23-Feb-14	Service by Darren Humphries			4
24-Feb-14	Service by Darren Humphries		9	
26-Feb-14	Service by Darren Humphries		2	
27-Feb-14	Service by Darren Humphries		2	
01-Mar-14	Service by Darren Humphries		5	
27-Mar-14	Service by Darren Humphries		2	
28-Mar-14	Service by Darren Humphries		2	
N/A	**Total Hours**		**31**	**16**

The following table illustrates the additional expenses incurred for the additional Environmental Monitoring System Training Expenses Certifications (14-0617-VIW-06A-M Rev. A):

Description	Hours-Unit	Rate-Price	Price
Overtime @ 1.5	31	$217.50	$6,743.00
Overtime @ 2.0	16	$290.00	$4,640.00
Expenses Systems Operation & Maintenance (Jan – Mar) Expenses	1	$27,415.00	$27,415.00
			$38,798.00

2.2 Travel & Living Expenses for Training

Item	Description	Price
1	System Training Travel & Living Expenses (Ray Fain. Tom Barnhart and Marsha Layma	$9,709.00

2.3 Administration/Management

Description	Price
Administration and Retention Cost	$4,646.00

3 Commercial Document

3.1 Investment

The prices herein offered to VIWAPA for the Fixed Price Proposal, defined in the Technical Document section is

INVESTMENT	
Systems Operation & Maintenance (Jan - Mar) and Environmental Monitoring System Training Expenses	$53,153.00

Table 1 Investment

The price is based on the supply volume as set in this document, which has been defined according to our interpretation of the information supplied by VIWAPA. Rockwell Automation declares that the present price only applies to the total amount of quoted concepts and will be subject to revision in case the scope changes.

3.2 Clarifications

All prices are in American Dollars and will be payable in national currency, according to the exchange rate at the billing time. All applicable taxes are not included, and will be added in the bill. Not existing any difference or addition to the contents of the solicitude documents given by VIWAPA, this proposal is offered, subject to the Sales Agreement (attached to this quote).

Restriction of Hazardous Substances (RoHS)

All Customer-Furnished Equipment (CFE) and Customer-Specified Material (CSM) will meet all applicable material restrictions as defined in RoHS. If it does not, Customer will notify Supplier prior to shipment of the CFE to Suppler. Customer will defend, indemnify, and hold harmless Supplier, its representatives, agents and employees from and against all claims, damage, losses and expenses, including attorney fees, associated with any requirements or regulations requiring these material restrictions for products or solutions.

The EU RoHS regulation takes effect July 22, 2017. Prior to this date, Supplier reserves the right to submit a Change Order proposal for any requirements for RoHS-compliant products or solutions imposed on Supplier from Customer or any third parties empowered to do so.

3.3 Commercial Terms

In case you would like to buy, we will appreciate if you include in your request the following text:

"Requested, based on the quote number 14-0617-VIW-06A-M Rev. A, date October 15, 2014 and the terms and conditions contained in it (SSA). The present document clearly expresses the will of both parts, so any previous - written or oral- agreement is now invalid."

Please emit your purchase order to:

Rockwell Automation Puerto Rico Inc

Calle 1 Metro Office Park 6

Suite 304

Guaynabo, PR 00968

Please forward all Purchase Order information to: SSBAguadillaOrders@ra.rockwell.com

Phone: 787-658-1400

Reference Rockwell Automation Proposal Num.: 14-0617-VIW-06A-M Rev. A

For additional Information related to payments please contact the Financial Department 787-658-1400.

Billings

Percentage [%]	Upon
100%	Advance payment with Purchase Order

Table 2 Billings

Validity of the Offer

This offer will have a validity of 30 days, starting at the expedition date. Should Buyer wants to place a purchase order after this period of time, a previous notification will be required to confirm that prices have not changed. Rockwell Automation reserves the right to declare this offering invalid and re-quote any opportunity over 30 days old.

3.4 Additional Services

The Global Manufacturing Solutions (GMS) group is responsible for the execution of projects, trainings and post-sale technical support. It is formed by professionals in various disciplines that intervene in each and every one of the stages of the life-cycle of the project. This is way Rockwell Automation places at your disposition descriptive information about some complementary services that may be of help along the execution of the project.

Should you be interested, please contact our Sales Representative of Rockwell Automation or the closes authorized distributor, or call us at (787) 658-1400 or (787) 300-6200.

Training Services

Our comprehensive, flexible training portfolio is focused on helping our customers develop a workforce that is ready to meet any challenge – and ultimately, improve production, lower turnover and increase employee morale. Identify skill gaps and improve job performance and productivity with the expertise of Rockwell Automation. We can help you bring together all the pieces of workforce training into a comprehensive workforce training solution.

Rockwell Automation Training Services has been accredited as an Authorized Provider by the International Association for Continuing Education and Training (IACET)

There are many available courses and different ways in which to take them. These are the most popular and recommended courses that can be taken at a Rockwell Automation Training Center (the course dates are fixed and you should contact us in order to know where and when the course will take place).

Studio 5000™ Logix Designer Level 1: ControlLogix® System Fundamentals

This course will assist you in developing and building a solid foundation with a fundamental knowledge of ControlLogix and other Logix5000™ systems.

You will be introduced to basic Logix5000 concepts and terminology, and you will be exposed to Logix5000 system hardware, including hands-on experience with the ControlLogix platform.

You will also have an opportunity to use Studio 5000™ Logix Designer application to perform basic system configuration tasks.

- Length: 2 days
- Tuition: Upon Request

FactoryTalk View SE Programming

Upon completion of this course, you should be able to organize and develop FactoryTalk View Site Edition (SE) applications. This course provides opportunities for you to work with local FactoryTalk View SE applications. During class, you will have the opportunity to practice the skills used to create an application and build graphic displays.

You will learn how to configure alarms and security, trend data, and test your application using FactoryTalk View SE Client. You will also work with RSLinx Enterprise communications software and the FactoryTalk Diagnostics system. After practicing these skills in a local application, you will receive a high-level overview of how a network application is created.

- Length: 4.5 days
- Tuition: Upon Request

Parts Management Agreement

A Parts Management Agreement provides quick access to the Rockwell Automation spare parts you need, while reducing your operating costs to maintain and manage your spare parts inventory.

Through a Parts Management Agreement, Rockwell Automation owns and manages your spare parts inventory for a fixed monthly or quarterly cost. These agreements are backed by our remanufacturing services to replenish any inventory used.

A PMA is valuable to companies who:

- Are looking for alternatives to a spare parts purchase
- Have an application in which uptime is critical
- Want a reduction in mean time to repair
- Want to improve control of their inventory assets
- Want a reduction in the carrying costs associated with maintaining inventory
- Require immediate availability of critical spare parts
- Want improved inventory integrity

Post Start-up Service

This service is planned to cover and supply support services and on-site visits to ensure that the implemented systems in one or many areas of the facilities are working correctly.

The activities included within this support services may cover objectives such as:

- Minimizing unscheduled system shutdowns due to control technology faults.
- Minimizing machine breakdowns due to control system fault.
- Updating programming and monitoring executable.
- Informal maintenance and plant staff training.
- Assessment to determine best practices in order to solve system faults, supporting the control systems operation.
- Creation of made changes backup and documentation.
- Implement the methodologies, procedures, and strategies to back up the application programs to warranty the availability of the latest version, in case they are required.
- Drives control application support
- Versa View HMI application support
- PowerFlex Drives application support
- ControlLogix application support
- DeviceNet, ControlNet and EtherNet support

TechConnect

Regardless of your business goals, TechConnect can help you unlock the potential of your operation. Using the valuable tools packaged with every TechConnect contract and our team of trained experts, you have ability to reduce maintenance time and costs, and improve your overall equipment effectiveness.

With TechConnect you will be able to maintain your software, access comprehensive online support, and obtain real-time telephone support. These may be achieved through the best option available for this service, which are listed as follows:

WELCOME KIT

Self-Assist Service	Essential support agreement information / Support authorization number / Local support telephone number / User guide
	SOFTWARE MAINTENANCE I Software update downloads
	ONLINE SUPPORT CENTER ACCESS Knowledgebase tech notes / Interactive forums / Product notifications / Manage service tickets / Submit questions via email
Product Support	**REAL-TIME, PRODUCT-LEVEL PHONE SUPPORT** Standard product and programming software / Telephone and live chat support available in > 20 languages / Remote desktop troubleshooting
	SOFTWARE MAINTENANCE II Software update media / Emergency software replacement
System Support	**REAL-TIME, SYSTEM-LEVEL SUPPORT** Standard product and programming software / Advanced software / Proactive followup / Single-point resolution
	REMOTE ACCESS AND ALARMING OPTIONS Remote connection to your system, providing Rockwell Automation engineers remote access to troubleshoot issues collaboratively and proactively
	GENIUS WEBINARS Extend and apply knowledge gained via access to on-demand library of online technical seminars
Application Support	**REAL-TIME APPLICATION-LEVEL SUPPORT** Designated support team / Dedicated telephone and email / Documentation and code familiarization / Application knowledge management / Periodic performance reviews
	SURVEILLANCE AND ALARMING OPTIONS Device and/or process monitoring and alarming at Rockwell Automation facility or remotely / Access to historical data for troubleshooting
	APPLICATION-LEVEL ADMINISTRATION OPTION Emergency backup / Performance tuning / Guaranteed field service call-out

System Sale Agreement (SSA)

All work to be performed under this Statement of Work is binding upon the parties by its acceptance and signature herein. The work will be subject to the terms and conditions of Contract # SC-47-13, its Addendums, Exhibits and Proposal 13-0212-VIW-01J-M.

Rockwell Automation

DOCUMENTED CHANGE REQUEST	
Document Title:	
Date Modified:	Revision: A
Revision Note:	
IFS Document #:	Alt Doc #:

PROJECT INFORMATION	
Proposal Number:	Q
Project Number:	P
Project Name:	
Project Manager:	

CHANGE INFORMATION	
DCR#:	Date:
Subject:	Initiated By:

Classification of Request:

- ☐ Functional Change
- ☐ Clarification
- ☐ Final Design Detail
- ☐ Other: Engineering Support
- ☐ Documentation Error
- ☐ Operational Suggestion
- ☐ Schedule Change

Recommended Priority: ☐ High ☐ Medium ☐ Low

Areas Impacted:

- ☐ Hardware & Engineering
- ☐ Drafting
- ☐ Other:
- ☐ Software & Engineering
- ☐ Assembly

Description of Change

Item No.	Item Description	Price
	TOTAL	

Notes:

Rockwell Automation

DOCUMENTED CHANGE REQUEST	
Document Title:	
Date Modified:	Revision: A
Revision Note:	
IFS Document #:	Alt Doc #:

Project Impact Estimate			
Lost Time:		Labor	
Schedule:		Expenses	
Other:		Material	

Offer Expires 30 Days from Date of Record	**DCR Value** | **0**
☐ Approved ☐ Rejected ☐ Revise as Noted & Re-submit	Customer Notes: 1)
Customer Approval: Date:	Rockwell Approval: Date:

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Rockwell Automation

February 15, 2016
Mr. Maxwell George, Environmental Affairs Manager
P.O.BOX 1450
ST.THOMAS, USVI
U.S. VIRGIN ISLANDS 00804-1450

RE: Training Expenses WAPA Contract SC-47-13

Dear Mr. George:

As requested, hereby a detailed breakdown on the expenses associated to the Training section of the Environmental Solution Project under VIWAPA contract SC-47-13
In attached file you will find:

- **TAB#1:** summary of the portion of the invoices attributable to training provided, classroom training logs and hands-on training official Extended Scope (Year1, Year2, Year 3) All invoices have been submitted on timely manner with the breakdown indicating the item corresponding to training activity.
    - TOTAL $175,713
- **TAB#2:** it is also included the percentage of travel and living expenses **attributable to training**, which has been estimated in agreement with WAPA, to 23% of the total amount.
    - TOTAL $65,940.52
- **TAB#3:** Training associated to spare parts management. Total of 246hrs.
    - TOTAL $37,680.00
- **TAB#4:** Training associated to Procedure development.
    - TOTAL $57,142.00

TOTAL $336,475.52

Best Regards

Alejandra Quevedo
Sales Leader
Rockwell Automation Caribbean Region

TAB #1

Hands On Training

TAB #1 - HANDS ON TRAINING

Invoice number	Line Item	Project	Amount	Received payments	Invoice date	Comments	Total	On Site Training	On the Job Training
I606722	5, 6	P983Y418	67,189.89	67,189.89	09/09/13	Training $4,881.00 (August 2013) - Training $4,881.00 (September 2013)	$9,762.00		Opacity Wiring CGA Procedure Opacity Troubleshooting Techniques Opacity Audit
I606770	22, 24	P983Y418	67,437.10	67,437.10	11/26/13	Training $4,881.00 (October 2013) - Training $4,881.00 November 2013)	$9,762.00		Daily Calibrations CO Analyzer Maintenance Opacity Troubleshooting Techniques Unit transitions @ STT and STC Panel Swap Maintenanced Unit 24 for EPA Audit Unit 20 Opacity Troubleshooting Sample Pump Repair Chiller Troubleshooting and Repair DAHS Navigation and Training
I606791	3	P983Y418	58,068.26	58,068.26	12/30/13	Training $4,881.00 (December 2013)	$4,881.00	Regulations Overview Review of Facility-Specific Permits Monitoring Fundamentals Review of Facility-Specific Permits Monitoring Fundamentals Ongoing QA/QC Procedures Part 60 - Hourly Validation Part 60 - Calculating Emissions Part 60 - Recordkeeping Requirements Reporting Requirements Part 60 - Subpart D Part 60 Subpart - Da Part 60 Subpart - Db Part 60 Subpart - GG Part 60 Subpart - KKKK Part 60 - QA/QC for CEMS Part 75 - QA/QC for Fuel Flow meter Systems Part 75 - Appendix G	Unit 19 Calibrations STX RATA Testing Preparation DAHS Navigation and Training Unit 18 CO calibration Unit 17 Probe Seal Replacement Unit 18 Chiller Repair Installed Isolator's on Unit 22 (STT) Sample Pane Troubleshooting (STT) Nox Calibration (STT) Calibration of Sample Panel Temps (STX)
I606803	24	P983Y418	33,021.00	33,021.00	01/30/14	Training $4,881.00 (January 2014)	$4,881.00		Nox Calibration (STX) Chiller Troubleshooting and Repair (STT) Alarm Configuration (STT) COMS Audit Procedure (STT) Sample Pump Repair Network Switch Troubleshooting COMS Audits (STX) Nox Analyzer Calibration Unit 20 & 24 Nox/O2 Troubleshooting

TAB #1 - HANDS ON TRAINING

Invoice number	Line Item	Project	Amount	Received payments	Invoice date	Comments	Total	On Site Training	On the Job Training
I606820	14	P983Y418	33,021.00	33,021.00	02/27/14	Training $4,881.00 (February 2014)	$4,881.00	General Data Flow and System Architecture QA Emission Point Advantage QA Site and Enterprise Advantage	Clear Stack Reset & Jig Iris Adjustment Zero and Span Iris Adjustments Daily Calibrations (STT and STX) Corrective Adjustments (STT and STX) Manually zeroing and spanning analyzers This includes all types (STT) Routine Daily System Checks DAHS HMI
I606827	8	P983Y418	35,302.87	35,302.87	03/28/14	Training $4,881.00 (March 2014)	$4,881.00		Parts Inventory Routine Daily System Checks Unit 16 CEMS Calibrations PMT replacement Calibration Bottle Change Procedure CO Span Adjustment Opacity Re-alignment CGA Procedures for STT and STX
I606842	17	P983Y418	33,021.00	33,021.00	04/30/14	Training $4,881.00 (April 2014)	$4,881.00		CGA Procedure Training Analyzer Span Adjustment Chiller Maintenance (STX) Opacity Calibration (STX) Nox Calibration (STX) CGA Procedure
I606858	5, 6	P983Y418	66,042.00	66,042.00	06/30/14	Training $4,881.00 (May 2014) - Training $4,881.00 (June 2014)	$9,762.00		CGA Procedure Training Opacity Maintenance Chiller Toubleshooting and Repair Routine Daily Checks for STX and STT Instructed on full procedure DAHS Navigation CGA Procedure CO Analyzer Training CGA And Comm's Audit (STX) Opacity Replacement COM's Audit
I606870	13	P983Y418	33,017.00	33,017.00	07/23/14	Training $4,881.00 (July 2014)	$4,881.00		Routine Daily Checks for STX and STT Instructed on full procedure Routine Daily Checks for STX and STT Instructed on full procedure II DAHS Navigation
I606889	3	P983Y418	40,944.00	40,944.00	09/05/14	Training $4,881.00 (August 2014)	$4,881.00		Routine Daily Checks for STX and STT Instructed on full procedure Routine Daily Checks for STX and STT Instructed on full procedure DAHS Navigation Routine Daily Checks for STX and STT Instructed on full procedure Opacity Alignment Troubleshooting

TAB #1 - HANDS ON TRAINING

Invoice number	Line Item	Project	Amount	Received payments	Invoice date	Comments	Total	On Site Training	On the Job Training
I37226	3, 6	P983Y418	81,888.00	81,888.00	10/30/14	Training $4,881.00 (September 2014) - Training $4,881.00 (October 2014)	$9,762.00		CGA and Comm's Audit (STT) CGA and Comm's Audit (STX) Sample System Troubleshooting Power Outage @ STT required complete loading of Windows and restoration of virtual machines Routine Daily Checks for STX and STT Instructed on full procedure DAHS Navigation Routine Daily Checks for STX and STT II Instructed on full procedure II Routine Daily Checks for STX and STT III Instructed on full procedure III
I37568	3	P983Y418	40,944.00	40,944.00	11/26/14	Training $4,881.00 (November 2014)	$4,881.00	Regulations Overview NSPS Introduction / General Requirements Review of Facility-Specific Permits Monitoring Fundamentals Ongoing QA/QC Procedures Part 60 - Hourly Validation Part 60 - Calculating Emissions Part 60 - Recordkeeping Requirements Reporting Requirements Part 60 - Subpart D Part 60 Subpart - Da Part 60 Subpart - Db Part 60 Subpart - GG Part 60 Subpart - KKKK Part 60 - QA/QC for CEMS Part 75 - QA/QC for Fuel Flow meter Systems Part 75 - Appendix G	No Hands on Training
I37903	3	P983Y418	40,944.00	40,944.00	12/29/14	Training $4,881.00 (December 2014)	$4,881.00		unit 17 coms audit. CGA for units 16, 17, 19, 20 and 21 CGA for units 15, 18, 21 and 23. coms audit for units 21 and 23
I38618	3	P983Y418	40,944.00	-	02/26/15	Training $4,881.00 (February 2015)	$4,881.00		unit 18 opacity monitor troubleshooting and repair unit 23 opacity monitor troubleshooting
I39338	3	P983Y418	40,944.00	40,944.00	04/29/15	Training $4,881.00 (March 2015)	$4,881.00		Had him physically run through all the steps of performing a COMS audit. Troubleshooting and repairing process with Unit 23's opacity COMS audit performed on Unit 18
I39509	3	P983Y418	40,944.00	-	05/08/15	Training $4,881.00 (April 2015)	$4,881.00		Nox Analazer troubleshooting Nox Analazer troubleshooting II Nox analizer replacement Converted Unit 23 from using a dual-blend CO Low/O2 bottle to using separate CO and O2 bottles for it's daily calibrations. This required reconfiguring the daily calibration sequencing and modifying the existing regulator setup.

TAB #1 - HANDS ON TRAINING

Invoice number	Line Item	Project	Amount	Received payments	Invoice date	Comments	Total	On Site Training	On the Job Training
I39642	3	P983Y418	40,944.00	-	05/21/15	Training $4,881.00 (May 2015)	$4,881.00		Unit 23 sample system modification to allow the use of ambient air for daily calibrations Unit 18's sample panel troubleshooting Changed the particulate filter, and cleaned the particulate filter housing for Unit 15's Sample panel. Unit 15 Opacity zero and spanning the calibration arm on the stack
I40031	3	P983Y418	40,944.00	-	06/23/15	Training $4,881.00 (June 2015)	$4,881.00		All CO analyzers Zeroed and spanned back to appropriate calibrations
I40789	3	P983Y418	40,944.00	-	06/23/15	Training $4,881.00 (July 2015)	$4,881.00		new CO low and O2 low bottle, perform the swap out and enter all new data into the computer, and then perform a calibration. swap out regulators on different bottles rebuild of a standard gas regulator Battery backup on U23 was unstable, not charging. Loose connection was repaired
I40858		P983Y418				(August 2015)	**$4,881.00**		Entering of custom action codes Use of Data Tools for data maintenance System maintenance and trouble-shooting related to data gathering from analyzers Wiring installation and setup Installation and setup of splitters and isolators for second server Installation and setup of secondary power systems Installation and service of server unit
I41305		P983Y418				(September 2015)	**$4,881.00**		Correction of the Fuel and water readings by adjusting the scale Training on CGA Testing Training on CGA Testing CGA testing and performed the testing on U21 and U15. COMS Audit units 21 and 23 St Croix U17 and U20 COMS
I41890		P983Y418				(October 2015)	**$4,881.00**		Training on COMS reports Adjusting and identifying incoming signals, eg. fuel, water. U21 Nox failed and had to be zeroed and spanned Regular maintenance of an opacity remote panel Calculation and determination of RATA required gases and equipment. Adjustment of scaling for fuel and water readings. EPA regulations regarding CGA and COMS audit testing U18 Opacity signal testing and adjustment. U15 Sample panel HMI burned out and required replacement. Training on installation and setup. Troubleshooting and repairs on CEMS equipment. Dual analyzer setup and testing. DAHS and analyzer maintenance DAHS record keeping. Analyzer disassembly U21 opacity remote panel repair and installation Making changes to reports

TAB #1 - HANDS ON TRAINING

Invoice number	Line Item	Project	Amount	Received payments	Invoice date	Comments	Total	On Site Training	On the Job Training
I42254		P983Y418				(November 2015)	**$4,881.00**		Analyzer disassembly and troubleshooting. Invalid signal investigation technics. Trouble shooting the analyzers and DHAS systems Operation of the Opacity systems. Entering and modifying action and reason codes. Inventory management. Opacity modifications and adjustment. Sample panel maintenance. Pump rebuild and installation. Sample panel issues and other possible issues during Jake's leave.
I42256		P983Y418				(December 2015)	**$4,881.00**		RATA Testing and equipment. RATA equipment. RATA setup. COMS reports. RATA procedure and set up. Opacity maintenance.
I42514		P983Y418				(January 2016)	**$4,881.00**		Report retrieval. Signal testing and basic electrical repair.
							$112,263.00		

TAB #2

TNG T&L Expenses – 23%

TAB #2 - TNG T AND L EXPENSES

Invoice number	Line Item	Project	Amount	Comments
I606791	4	P983Y418	$25,047.26	
N/A	-------	P983Y418	$37,469.00	In Progress
N/A	-------	P983Y418	$32,149.66	In Progress
N/A	-------	P983Y418	$53,000.00	In Progress - expecting PO
I41427	1	P983Y418	$63,047.00	
I41610	4, 5, 6	P983Y418	$14,925.00	
I41890	4	P983Y418	$4,975.00	
I42254	4	P983Y418	$4,975.00	
I42256	1	P983Y418	$46,135.00	
I42514	4	P983Y418	$4,975.00	
			$286,697.92	
		Total (23%)	**$65,940.52**	

TAB #3

TNG Spare Parts

TAB #3 - TNG SPARE PARTS

Invoice number	Line Item	Project	Comments	Total	On the Job Training
I40858	2	P983Y418	Spare Parts Management (August 2015) - 32 hrs.	**$5,024.00**	1. Do Physical inventory when on the island and update report. 2. Follow up to make sure the above activity is completed when not on the island. 3. Consolidate reports from both islands STT and STX. 4. Distribute report to all interested parts.
I41305	2	P983Y418	Spare Parts Management (September 2015) - 80 hrs.	**$12,560.00**	1. Do Physical inventory when on the island and update report. 2. Follow up to make sure the above activity is completed when not on the island. 3. Consolidate reports from both islands STT and STX. 4. Distribute report to all interested parts.
I41890	2	P983Y418	Spare Parts Management (October 2015) - 32 hrs.	**$5,024.00**	1. Do Physical inventory when on the island and update report. 2. Follow up to make sure the above activity is completed when not on the island. 3. Consolidate reports from both islands STT and STX. 4. Distribute report to all interested parts.
I42254	2	P983Y418	Spare Parts Management (November 2015) - 32 hrs.	**$5,024.00**	1. Do Physical inventory when on the island and update report. 2. Follow up to make sure the above activity is completed when not on the island. 3. Consolidate reports from both islands STT and STX. 4. Distribute report to all interested parts.
I42256	2	P983Y418	Spare Parts Management (December 2015) - 32 hrs.	**$5,024.00**	1. Do Physical inventory when on the island and update report. 2. Follow up to make sure the above activity is completed when not on the island. 3. Consolidate reports from both islands STT and STX. 4. Distribute report to all interested parts.
I42514	2	P983Y418	Spare Parts Management (January 2016) - 32 hrs.	**$5,024.00**	1. Do Physical inventory when on the island and update report. 2. Follow up to make sure the above activity is completed when not on the island. 3. Consolidate reports from both islands STT and STX. 4. Distribute report to all interested parts. 5. Software Analysis to improve the Spare Management execution.
			Total	**$37,680.00**	

TAB #4

TNG Pro

TAB #4 - TNG PRO

Invoice number	Line Item	Project	Amount	Comments
I606890	3	P983Y418	$28,571.00	
I41460	3	P983Y418	$28,571.00	In Progress
		Total	**$57,142.00**	

APPENDIX E

UPCOMING CLASSROOM TRAINING SCHEDULE

Awaiting confirmation from Rockwell and QA Support. To be supplied.